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The Better Lighting of Shops.

IN the course of the discussion on Mr. W. E. Jones's paper at the last E.D.A. conference, Mr. W. E. Bush mentioned a matter which deserves far more attention than it appears to receive. We refer to the advantages that are to be gained by those concerned with the improvement of illumination getting into direct touch with the consumer himself.

Co-operation between electricity suppliers and electrical contractors in this connection may be very valuable. This is clear whether we consider what Mr. Jones had to say respecting what is happening with large sales departments at Boston in the stimulation of lighting development, or what Mr. Bush stated regarding our less extensive operations here. We are not at the moment thinking of that particular co-operative spirit which means friendly relations and the avoidance of local differences between different sections of the trade—of course, we hope for that as time goes by, as the result of the work of the special committee which sometimes meets to consider questions arising under Section 48 of the Electricity Act. The special brand of co-operation that we require for securing better lighting is more in the nature of combined action on the part of electricity suppliers and contractors in arousing the interest of the shopkeeper and the householder in what we used to call "illuminating engineering." We have made a great deal of progress in the better lighting movement since that term was first introduced to describe a gas-electric profession many years ago, but in the electrical world—we are not concerned with gas—there is still much room for improvement. Last winter we were all engaged in a campaign which was called by various titles, but we believe that it was more conspicuously successful as an *extension* movement than as a campaign bringing about greater efficiency of individual installations. Be that as it may, at E.D.A.'s second meeting for the 1927-8 session, while Circles are getting to grips with the problems arising

out of their special local programmes, we have a speech by Mr. Bush, of the E.L.M.A. Lighting Service Bureau, stating that, whereas in England we have small armies of salesmen calling upon contractors, in America the great army of salesmen concentrate upon the consumers. This must not be interpreted as advocacy of "direct dealing" in the general sense. In the States for such a purpose, according to Mr. Jones, there is the greatest co-operation between the supply people and the contractors. They operate under one large lighting service department as at Boston, for example, and the result is not only more extensive lighting, but the improved efficiency of existing installations. Mr. Bush explained that in this country when his own assistants call upon shopkeepers in order to collect information on shop-lighting installations generally, they find shopkeepers eager to improve their lighting and anxious to know where to go for advice upon which they can take action.

This inclines us to make what we believe to be a timely suggestion. What is there to prevent electrical supply and contracting interests surveying the shop-lighting thoroughfares in their areas just after lighting-up time—a systematic study, say, from the top of a tramcar, noting the bad spots with a view to opening conversations? Some who have done this have found that two journeys over the route will give them some very useful information regarding the premises where there is room for improvement. There is all the difference in the world between good and bad shop lighting; the contrasts are often most marked, and it is easy to see where the expert adviser has made his influence felt. The shopkeepers may frequently be of the kind mentioned by Mr. Bush. They make a poorer showing than their competitors, may be doing a smaller business in consequence—almost certainly they are—but have never seriously thought that their poorer lighting is in any way to blame for their poor profits and unpopularity. An enterprising individual contractor can make investigations "on his own"; so can the department of an electricity company or municipality; so long as somebody does it, it matters little who that somebody is. If shopkeepers are ignorant on this matter, and if experience shows their desire to amend their ways, as Mr. Bush says, we are missing a golden opportunity if we do not immediately tackle the situation.

Our comments have been directed mainly to shop illumination, but they have application to household lighting too, though that calls for different treatment. The fact that shop lighting is public, displaying to all comers its merits or demerits, is a basis of introduction; private lighting is seldom open to the public gaze, therefore the knowledge has to be discovered and the basis of introduction found—perhaps by the contractors' representative when called in, or the electricity supply canvasser or meter-reader on his periodical visits.

The numerous E.D.A. circles should find this a subject for profitable discussion and activity, for in less than a month shops will be at the height of their Christmas gaiety.

There is unquestionably a great deal of work to be done both for the shopkeeper and the private householder if they can only be convinced of the cheapness and often the facility with which changes can be made.

Electrical Standardisation Problems.

The excellent address which Mr. C. G. Morley New delivered recently before the Western Centre of the Institution of Electrical Engineers, and of which an abstract appears elsewhere in this issue, is a valuable contribution to current thought upon the new conditions obtaining in the electricity supply industry, as the result of the legislation enacted since the war. As he points out, the three Acts have had a tendency to retard development owing to the uncertainty produced with regard to the availability of generating plant to meet increased demands; until the operations of the Central Electricity Board bear fruit, that tendency will endure, and it may be that the next two or three years will prove by no means comfortable ones either for manufacturers or for a good many managers of supply undertakings. Certain branches of industry will no doubt derive benefit from the new schemes in the near future; the erection of transmission lines will stimulate the manufacture of line materials, switchgear, and transformers, and the standardisation of frequency will provide work for motor manufacturers, but the programmes adopted by the Board do not involve the installation of a great deal of generating plant at early dates—indeed, one of the principal claims made for the schemes is that plant at present held as spare will be brought into profitable use as a result of interconnection. As we have pointed out, capital is to be spent on mains instead of on station plant; whether it is the better policy remains for the future to decide.

Mr. New collates a number of interesting data with regard to the standardisation of frequency, and shows that the net cost of the change in the Central Scotland area will be about three millions sterling; the annual charges for this outlay (£180,000) will be spread over the whole of the electricity supply industry, and therefore the subject is of deep interest to all undertakings—especially, as he remarks, to those which being already standard will derive no benefit from the scheme. The estimated cost of standardising frequency throughout the country, under present-day conditions, is nearly 12 millions sterling, involving an annual charge of £725,000 for forty years. Cardiff, which at present contributes £291 to the Commissioners' ordinary expenses, will have to find an additional annual sum of no less than £4,432, based on last year's revenue, which is equivalent to an increase of over 16 per cent. in the coal bill. Mr. New concludes that the existing efficient generating stations will lose more than they stand to gain by the national scheme.

In passing, he touches upon the standardisation of distribution voltage, which in our opinion is vastly more important than that of frequency, and would be directly beneficial not only to the whole of the electrical industries—manufacturers, supply authorities, contractors, and retailers—but also to the great army of consumers, many of whom at present suffer grave inconvenience and loss from the vagaries of the original engineers who, with the approval of the Board of Trade, adopted all sorts of voltages. The Electricity Commissioners, after full investigation, have prescribed 230 volts as the normal standard, with the corresponding values of 460 volts d.c. and 400 volts a.c. for power. Can nothing be done to hasten the day when uniformity will prevail? Will the new motors of standard frequency be built for non-standard voltages? To do so would seem a preposterous proceeding, involving a further heavy outlay and dislocation of business at a later date, and we hope that the double conversion will be effected at one stroke.

London Transport Co-ordination.

The report of the London and Home Counties Traffic Advisory Committee to the Minister of Transport on the co-ordination of passenger transport facilities in the London area, which was issued last week, represents a notable endeavour to solve a problem which daily becomes more complex and, as the Committee states, is of imperative urgency. The scheme outlined is the outcome of proposals put forward by Lord Ashfield last year, to the effect that all passenger transport facilities should be brought under common management and pool their revenues, so that wasteful competition could be eliminated and adequate means of transportation provided at the minimum cost; the Committee has examined these proposals and emphatically endorses them as offering the only hope of improving the conditions, appealing for authority to commence the necessary negotiations at the earliest possible moment.

The Ferrybridge Power Station.

Details of the first 38,000-kW section of the Yorkshire Electric Power Co.'s new generating plant, which is destined to become a national capital station with a probable ultimate capacity of 250,000 h.p.

(Concluded from page 718.)

THE energy delivered from the alternators at a pressure of 11,000 volts is conducted to outdoor Ferranti transformers arranged along the western frontage of the turbine house, by means of which the pressure is increased to 33,000 volts, which is the normal distribution pressure from the station. Station power is obtained from 11,000-V bus-bars supplied through step-down transformers from the 33-kV bus-bars, and the station auxiliary plant is supplied at 400 volts through step-down transformers fed from the 11-kV bus-bars.

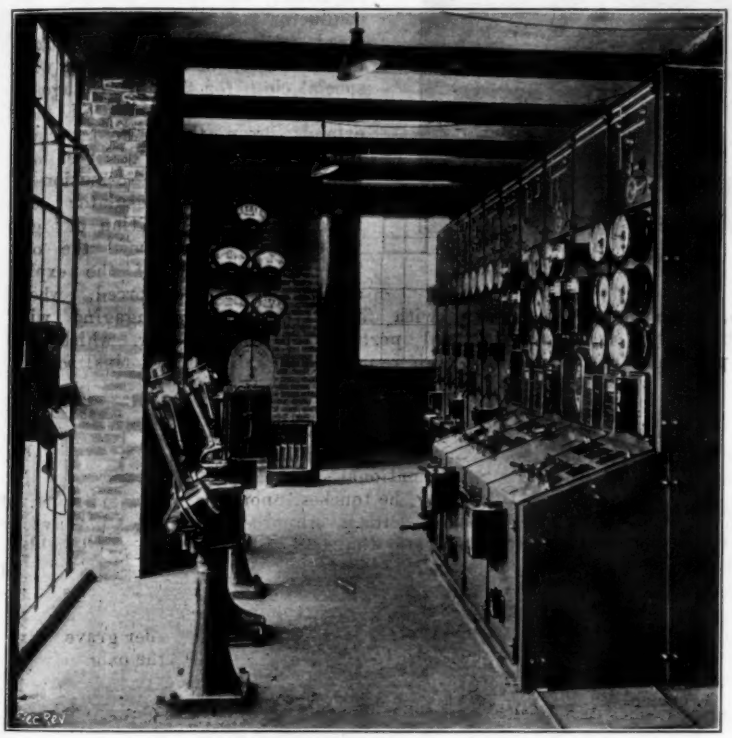

Fig. 9.—Main Operating Board in Switchgear Control Room.

All switching takes place on the 33-kV side; the main gear was manufactured by the British Thomson-Houston Co., Ltd., has a rupturing capacity of 1,500,000 kVA, and is of the phase-separated type with continuous vertical walls between the phases. All movement of switches is controlled by mechanism contained in an operating annexe (in which no live metal is exposed), which is entirely separated from the main-switch room. Especial care has been taken to reduce the possibility of a short circuit of conductors of differing polarity, and the conductors of different phases are kept entirely separate from the generator terminals to the dividing boxes on the individual feeder cables.

The main control panels for generator and voltage-regulator equipments are of the bench pattern, while the rest are vertical. Above the control panels a single-line diagram of the system is represented, the operation of oil circuit-breakers, isolating switches, &c., being automatically indicated thereon by means of relays, in addition to the usual signal lamps on the control panels.

The three phases of the switchgear are each accommodated in separate cubicles on the same floor, the oil circuit-breakers being electrically operated from the control room situated at the end of the switch house and running at right angles to it (fig. 9). One solenoid operating device is provided for the three single-pole circuit-breaker units, which are mechanically coupled through mechanism under the floor. All isolators, selectors, and earthing switches are operated in sets of three by signal levers, and their mechanism is arranged so that the rods which couple the various cranks are in tension whether the switches are being opened or closed. The solenoid pillars and signal-lever handles (seen in fig. 10) are accommodated in a special passage-way parallel to the main gear and separated therefrom by a wall.

The switchgear itself is of the "open" type (not totally enclosed in cubicles), and all insulators are of the outdoor pattern. The

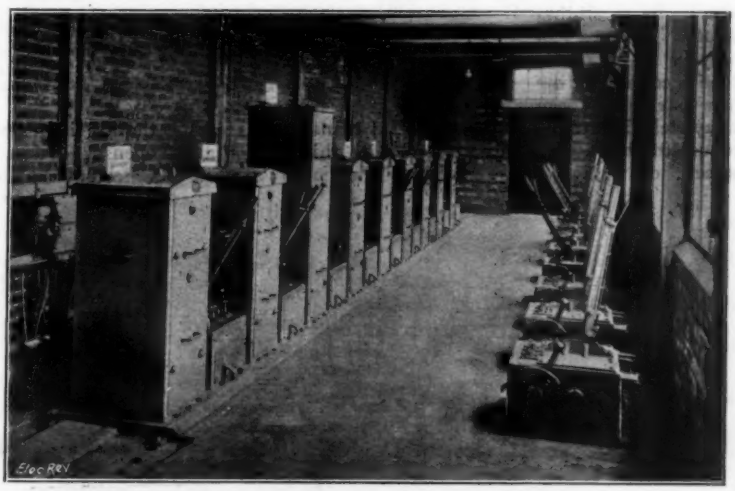

Fig. 10.—Switch Solenoid Pillars and Signal-lever Handles.

apparatus is mounted on a framework of rolled-steel sections, and sheet-steel screens are provided between sets of equipment to allow of safe access to a dead circuit while adjacent circuits are "alive." Movable flexible shutters are also interposed between

the clip contacts and blades of bus-bar selectors when the latter are open, to screen an isolated equipment from the bus-bars. Both main and auxiliary bus-bars are mounted on the top of the structure with a screened inspection gallery between them, as shown in fig. 11. The oil circuit-breaker top-plate is 9 ft. above the ground, at which level the top portion of the cubicle is separated from the bottom by a horizontal sheet-steel barrier, the top part of the cubicle being open, while the bottom part is enclosed by sheet-steel doors fitted with locks. The inspection gallery on the top is screened from the bus-bars by flexible shutters, which can be let down between contacts of the bus-bar selector switches, and also by sliding screens which can only be moved after the corresponding bus-bar has been completely isolated. Where potential transformers are required, their tank tops are level with this horizontal screen, connection being made to the main circuit through a spring contact on the transformer bushing and an extension to the hinged contact of the cable isolator. The transformer can be lowered to the ground when it is necessary to disconnect it from the main circuit, and on the guides for the transformers are projections which enable the operator to climb to the top portion of the cubicle through a manhole, which can only be uncovered after the transformer has been lowered to the ground, thus disconnecting both primary and secondary windings; no movable ladders are permitted inside the switch house.

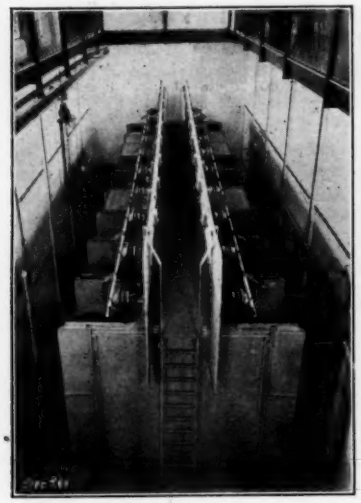

Fig. 11.—Main and Auxiliary Bus-bars.

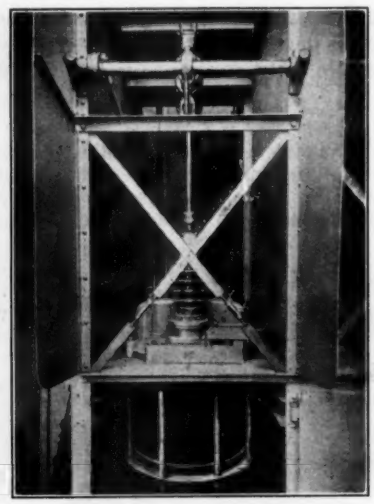

Fig. 12.—Oil Circuit-breaker.

One of the single-pole oil circuit-breakers is shown in fig. 12. The bushings are built up of upper and lower porcelain sections, cemented to a central cast-iron ring, which encloses bushing transformers when required; the space between the conductor and the porcelain shell is filled with insulating compound, the conductor being insulated with special cloth for the full voltage of the system. The central c.i. ring extends down the lower porcelain under the surface of the oil, thus checking the formation of corona along the insulator surface, and the ignition of gas in the air space above the oil. The contacts are of the explosion-pot type reinforced, where necessary, with finger-type contacts engaging with wedge-shaped portions of the crossbar, which are provided with rounded renewable arcing tips, so that the arc is drawn to the rounded end when the breaker opens and does not affect the parallel sides of the rod which engage with the fixed contacts. Throw-off springs increase the speed of break, which is accentuated under heavy fault conditions by the action of the explosion pots; oil dashpots prevent rebounding of the moving contacts. A plugged filling elbow and drain cock, oil-level gauge, and thermometer pocket are fitted to each tank; pebble-filled separating chambers and vent pipes are provided, the three pipes from the single-pole units of each equipment being connected to the same header, which runs under the floor and forms a drain for the gravel-filled troughs. A separate tank-lifting device is provided, which is capable of raising and lowering a complete single-pole breaker with the tank full of oil, if required. All selectors, isolators, and earthing switches are remote hand-controlled; each equipment is provided

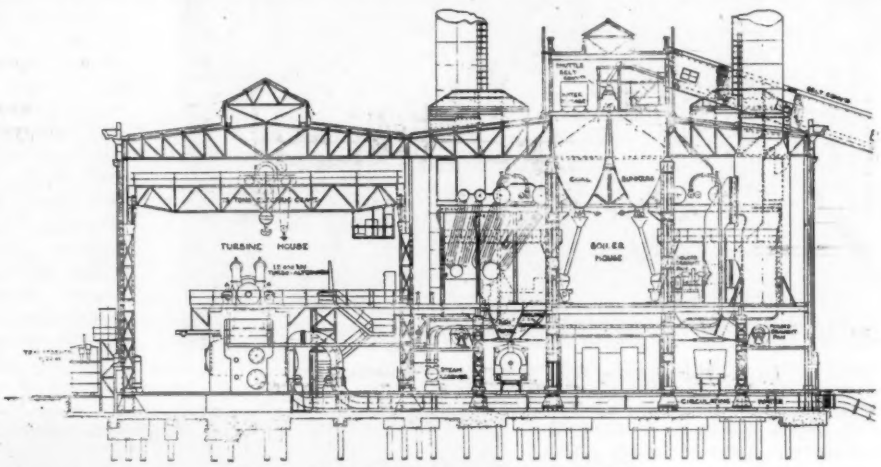

Fig. 13.—Cross-Sectional View of the Generating Station.

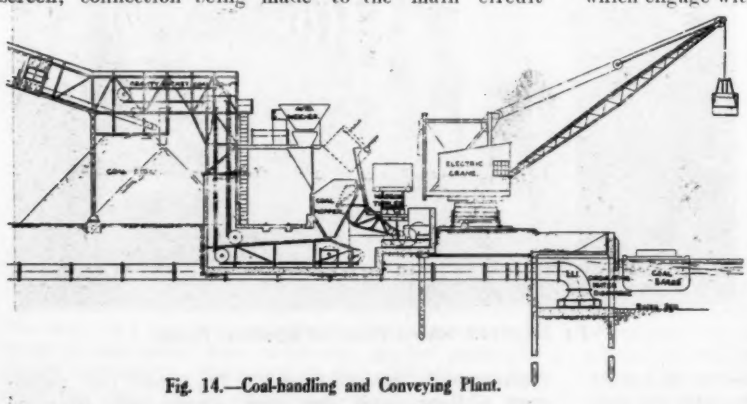

Fig. 14.—Coal-handling and Conveying Plant.

with four operating levers (fig. 10), three of which (operating bus-bar selectors and cable isolator) are mounted by the side of the solenoid mechanism, and the fourth (operating a special earthing switch) is mounted on a separate base. The bases of these operating levers contain mechanical interlocking devices and electrical interlock switches.

The hinge contacts of bus-bar selectors are mounted on the caps of insulators, two insulators rigidly coupled together being used in some cases for greater rigidity, while the cable isolator hinge contact is mounted on the cable sealing-box insulator. Clip contacts, in the case of bus-bar selectors, are mounted on the bus-bars which are, in turn, supported by insulators attached to the framework between equipments; the cable isolator slip contact is carried by the oil circuit-breaker bushing; this arrangement needs the minimum number of insulators. The movement of the switch blades is effected through cranks and rods, the insulation of which consists of a special moulded-rubber compound; the switch mechanisms are balanced in order to reduce the effort required to operate them.

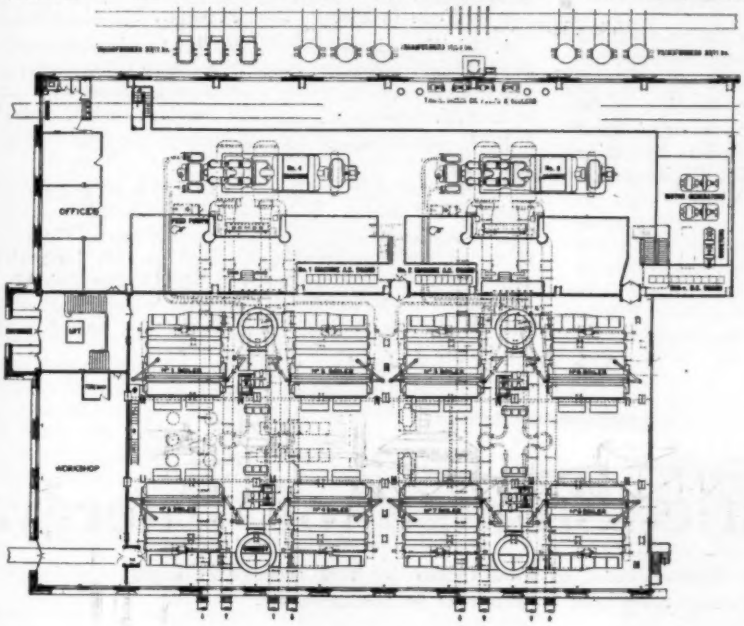

Fig. 15.—Plan of the Ferrybridge Power Station.

Current transformers for the operation of instruments and relays are accommodated in the oil circuit-breaker bushings; for the lower ratios where phase-angle accuracy cannot be obtained with standard bar-primary transformers, the B.T.-H. auxiliary "teazer" winding scheme has been adopted, whereby the secondary winding of a transformer on one phase is connected in series with a few turns of a transformer on another phase, thus producing a resultant current of the correct phase angle.

All potential transformers are oil immersed, single-phase, 33,000/110-V, both primary and secondary windings being star connected, so that the voltage impressed on the primary winding is 19,000 V, although they are insulated for 33,000 volts to earth continuously. The transformers are arranged to slide up and down a guide, and are raised and lowered by means of a removable winch mechanism and carriage; contact is made through springs. All transformers are provided with a two-way switch which either earths one end of the primary winding, or connects it to the other terminal for the purpose of pressure testing.

As an illustration of the rapid increase of the capacity of generating sets, it is interesting to note that, in order to provide power for various purposes on the site during the constructional period and to enable trials to be made of the auxiliary machinery and boilers, a 2,000-kW turbo-generator was installed temporarily in the workshop. It is not much more than a decade since such machines were being installed as main generators in many power stations.

The Company's originally authorised capital of two million pounds sterling was this year increased to six millions, with borrowing powers of one-half the issued capital, of which over four millions has already been expended in providing electricity in bulk at sixty distributing centres; and in conjunction with its associate, the Electrical Distribution of Yorkshire, Ltd., the Company is supplying electricity in many rural areas at prices which compare favourably with, and in some cases are less than, those charged in neighbouring towns.

The Company satisfies the power requirements of many important collieries, woollen and other textile mills, shipyards, steel, chemical, glass, and brickworks, &c., and it is interesting to note that the Company has made several agreements for the interchange of surplus energy with a number of collieries which own generating stations. Another branch of the Company's business which is of growing importance is the supply of electricity for public utility purposes, such as street lighting, sewage works and water works, rural operations, and domestic uses.

After inspecting the station, visitors were shown an extensive exhibition of industrial and domestic electrical appliances which had been staged to illustrate some of the many uses of electricity; a fine display, upon which the Company is to be congratulated.

[CORRECTIONS.—When describing the boilers last week (p. 717) the words "normal rating" should have been omitted.—The transformers at the Rodley sub-station and three similar ones at the generating station were made by the Brush Electrical Engineering Co., Ltd.]

Automatic Telephony.

A Method of providing the Subscriber with Automatic Verbal Signals.

By E. W. DURKIN, B.Sc.

IT is well known that in automatic telephone systems, facilities must be provided for acquainting the calling subscriber with the progress, or otherwise, of his call.

The method adopted by the British Post Office and other operating concerns has, in the opinion of the writer, serious drawbacks. It, of course, consists of providing the caller with various tone signals. For this scheme to be really efficient, it is apparent that the caller must be quite clear in his mind as to the meaning of each of the four tones which he may receive.

This is not always possible, since, even in the doubtful event of most regular subscribers and their immediate associates being able to memorise these tones and their meanings, there still remains the large number of telephone users who are not regular subscribers. These

are very important, since they are the field from which new subscribers are recruited, and what chance have they of gaining a favourable impression of the telephone service whilst they remain in ignorance of the signals transmitted to them? To such a caller the "busy tone" or "ringing signal" has no meaning, and an automatic telephone is a vague thing which may leave them stranded without explanation, and is therefore to be avoided.

In this country the telephone must be popularised if it is to attain the vogue which it certainly deserves.

The writer is informed that, several years ago, a method of transmitting semi-automatic verbal signals to subscribers on manual exchanges by means of an ordinary gramophone and transmitter was tried, but abandoned owing to such disadvantages as maintenance and record wear, and the fact that the exchange being manual, the caller often tried to "answer" the gramophone.

Up to the present, the writer believes, no proposal for automatic verbal signals in an automatic exchange has been put forward.

The object of these notes is to draw attention to the fact that an application of one of the methods of sound recording and reproduction now in use offers a solution of the problem of replacing tone signals by verbal signals. The method referred to is that employing the photo-electric cell, in which a beam of light passing through a "record" acts on the photo-electric cell and sets up current variations in an associated circuit in accordance with the sounds originally "recorded." In the application of this principle known as the "Phonofilm," these current variations, after amplification, are made to operate a loud-speaker.

The writer proposes that the principle be applied in automatic telephone exchanges, so that current variations, obtained by means of a photo-electric cell with the necessary apparatus and a suitable record, be applied to, and cut off from, the caller's line, when necessary, in a manner similar to the tones at present used. No loud-speaker would be required at the exchange, the signals, after amplification, being fed out to operate the caller's receiver.

Methods are available of preparing the records which the application would require, and the form which these would take would be determined by the fact that the reproduction of the signals must be continuous.

The British Post Office employs four different tones, and it is suggested that these might be replaced by verbal signals as follows, obtained from the records in the above manner:—

Tone in use.	Proposed verbal signal.
1. Dialling signal	"Dial number please."
2. Ringing signal	"Number being called."
3. Busy tone	"Number engaged."
4. N.U. tone	"Number unobtainable."

Each phrase would be repeated at suitable regular intervals.

Besides the improved service and increased popularity which would accrue, there are other advantages of this scheme apparent only to telephone engineers. To mention one, the instantaneous release on all ineffective calls would obviate the holding of valuable switching equipment at the automatic exchange, which must occur should a caller not be clear as to the meaning of the "busy" or "N.U." tone.

The Domestic Storage of Energy.

Some notes upon the improvement of load factor by heat storage at night, with particular reference to progress in Switzerland.

By L. G. A. SIMS, M.Sc. (Eng.)

(*Concluded from page* 720.)

TO turn to the auxiliary electrical gear required with these heaters, it is found that this is almost entirely concerned with the time switch. An immense variety of these switches is made, and their versatility is astounding. They are readily made electrically self-winding and will operate absolutely automatically remote-control gear capable of breaking 50 A at 6,600 V, or heavy currents up to 700 A at lower voltages. Figs. 8 and 9 show time switches suitable for operating a two-rate meter made respectively by the Venner Time Switch Co., Ltd., of London, and by Fr. Sauter, S.A., of Basle. For water-heating purposes on a cheap night tariff, or using the more complicated double- or triple-tariff system, it would be the supply authority's responsibility to maintain the time switch. The old design of simple time switch with a hand-wound movement, and capable of one straightforward operation, has been improved beyond all recognition. Switches which operate automatically a triple-rate meter, or which control a large oil-immersed quick-make-and break switch, are now items of normal manufacture. The self-winding switch is, of course, particularly interesting. It is likely to be a very accurate time-keeper since its spring works under conditions of approximately constant tension, re-winding occurring at frequent intervals. If electric heat storage becomes widely adopted here, this type of switch is likely to be in demand, and it is good news that one English manufacturing firm at least is aware of this and is busy with the final preparations for the manufacture of such switches. As an indication of the immense amount of thought which has been given to this subject, it may

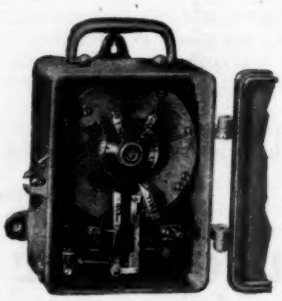

Fig. 8.—Venner Time Switch.

Fig. 9.—Sauter Time Switch.

be mentioned that self-winding switches are manufactured, for shop-window and street lighting, which adjust themselves automatically to the change in the

length of the day as the year proceeds, using an extremely simple mechanism, and are readily made suitable for use in any latitude. Indeed, there would seem to be no sphere of electrical engineering, from the research laboratory to the central station, in which one or other of the numerous modifications of the time switch could not be profitably employed. British engineers and manufacturers may well give close consideration to its present and future possibilities.

This article has so far dealt only with the storage of heat in water, because it is felt that this is the most promising branch of the general question, and the one for which the greatest application is likely in this country. There are other methods of heat storage which are in use in Switzerland and other countries. These may be classified as follows:—

(*a*) Storage systems for the heating of buildings, other than hot-water systems.

(*b*) Cooking systems dependent upon stored heat.

Buildings are heated in two different ways. The first entails the use of the "heat-accumulation stove," by which each room of a house or larger building, as the case may be, contains a stove using cheap night energy stored in stone blocks. The stone employed is described by the manufacturers as "steatite," and is a particularly hard stone with peculiar properties. It has a very high specific heat, and dissipates its stored heat-energy very gradually. It is quarried in the Gothard district of Switzerland, and it must be understood that, unless an effective substitute can be found here, the freightage alone would render its cost very high in this country. These remarks are not, therefore, intended to advocate the use of heat-storage stoves here at the present time, or until conditions are such that they could be made more attractive to the British purchaser in respect of cost, and perhaps also of general design. We are not accustomed to systems of convection heating in this country as are our Continental neighbours in their homes. There is, nevertheless, a great deal to be said in favour of thoroughly well-warmed rooms throughout a house, despite the arguments of those people who advocate local heating by radiation in cool rooms; so many of our days are not only cold, but also damp.

Fig. 10 shows a heat-accumulation stove of the type used widely in Switzerland. During the night, whilst storage is taking place, a damper in the top of the

Fig. 10.—A Swiss Heat-accumulation Stove.

stove is kept closed. In the morning, or whenever necessary, this is opened and convection currents, circulating through the stove upwards from the base, carry heated air into the room. These stoves are run readily from any source of supply, and are intended to work on a cheap night tariff, and are controlled by automatic time switches, like the water heaters. At present about 740 of them, with a total capacity of 2,550 kW, are installed in Basle alone. They take power usually between 10 p.m. and 6 a.m., according to the setting of the time switches by the supply authority.

A second system of storage heating for large buildings is illustrated in fig. 11. This consists in the

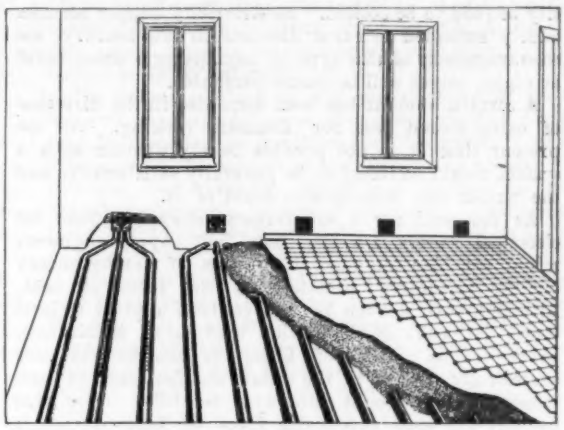

Fig. 11.—Electric Floor-heating System.

heating of the concrete floor by elements threaded through large porcelain beads, the whole forming a very flexible chain which can readily be drawn into metal tubes fixed in the floor material. Fig. 12 illustrates the ease of inserting or withdrawing the beaded elements from the tubes. This system is comparatively new, but it is sound in principle in that the floor has normally a large capacity for heat, and in that it is very readily run as a 3-phase balanced load, with

Fig. 12.—Method of Inserting Floor-heating Elements.

several alternative loadings. The system was installed in the Swiss Popular Bank at Zurich three years ago, the maximum loading being 270 kW. Several villas in and about Zurich have the system installed, capacities of 20, 32, and 58 kW having been employed, according to the size of the building. English visitors who travel to the Jungfrau by the Jungfrau railway will note that there is no visible heating source in the rooms of the Jungfraujoch station. A floor heating system of 27 kW is installed there.

All room-heating systems of whatever type form a less favourable load than the domestic hot-water systems of storage described in the earlier part of this article, for they are only needed in the cold weather. For this reason there has been a certain amount of restriction placed upon them, even in Switzerland, wherever feeders or mains were already well loaded.

Cooking by heat storage has its greatest application at present in the country districts. The Swiss farmer

cooks his cattle food electrically during the night, and there is no need for him to attend to it during the process. He has a well-lagged electric food boiler, and the cattle food forms the medium in which the heat energy is stored. A time switch, set by the supply authority to operate between extreme limits of 10 p.m. and 6 a.m., is adjustable by him to operate at any time he wishes between those limits, according to the quantity of food to be cooked. As electricity supply becomes widely extended to rural districts in this country, the encouragement of this type of load, using a cheap tariff at night, might well be found profitable.

A certain amount has been done also in the direction of using stored heat for domestic cooking. At the present time it is not possible to say whether such a system would be likely to be generally satisfactory, and the writer has considerable doubt of it.

As the need for a satisfactory storage system for electrical energy has long been felt, supply engineers might consider the general question of storing energy on the consumers' premises in the form of heat. Although such storage has not yet been applied to level down the peaks of the station load curve, it has been proved to be capable of filling in the hollows very successfully. That is, the system enables plant to earn money when it would otherwise be idle. For this country the most favourable form of heat storage is hot-water storage for home and public building supplies. Boilers must be well lagged, and power should be sold at a figure not greater than $\frac{5}{8}$d. per unit, and preferably at $\frac{3}{4}$d. per unit. The system is attractive to the consumer at such prices, and may, at the latter price, be shown to be cheaper than gas, and only very slightly dearer than coke under normal conditions. Time switches operating automatically single-, double-, or triple-rate meters, and probably of the self-winding type, would be a necessary part of the system. These would be entirely under the control of the supply authority in respect of setting, and would be hired to the consumer at a small figure.

The long-established use of central-heating systems on the Continent, in conjunction with certain peculiar natural resources, has probably been a factor there in the growing popularity of electrical heat storage for room heating by convection. Preference for the radiant heater, and other difficulties, would probably prevent any great demand being made at present for such heaters in this country, and, in any case, the load is not of such a favourable type, being seasonal. Floor heating, whilst in general it suffers from the last-mentioned disadvantage also, might have some application for factory heating here, where the day load is normally heavy, and the night load nil or very light.

The improvement of the farm load factor in rural areas with electricity supply may be accomplished if storage cookers, working at night, were introduced. Heat-storage systems should be very attractive to supply authorities on account of the extremely beneficial effect upon load factor, and the ideal nature of the load upon any type of supply in respect of low-current rating per heating unit, steady feed, balanced load, and good power factor.

The writer must acknowledge his indebtedness to M. Sauter and M. Burri, of Fr. Sauter, S.A., Basle, and to their British agents, Messrs. Nathan & Allen, Ltd., for wide facilities for seeing installations and manufacturing methods in Switzerland, and to Messrs. Archibald Low & Sons, Ltd., Glasgow, and to Messrs. Venner Time Switches, Ltd., London, for the loan of blocks.

Wireless Patent Royalties.

Inequalities and Uncertainties in many Countries.

By A. J. SMITH.

THE attention both of the public and the trade has been focused of late upon the heavy royalties payable on wireless receiving sets, and the recent campaign undertaken by the Radio Manufacturers' Association (ELEC. REV., October 14th, 1927, p. 649) in favour of a reduction has served to show the effect which these charges have upon selling prices, and the difficulties under which this side of the wireless trade is conducted, especially with regard to the increasingly important export section.

In this country it cannot be said that there has ever been any uncertainty on the question of patents or the royalties payable, as the holders of the main patents have controlled the situation from the commencement of broadcasting, and there has been no considerable evasion of the all-round royalty of 12s. 6d. per valve-holder on the part of the regularly-established manufacturers, whatever may be the case of the multitude of "home-constructor makers" who build sets in small numbers for disposal in their immediate neighbourhoods. The present movement on the part of established manufacturers and the trade in general is merely for some measure of relief from this burden, so that the selling price of manufactured sets may be reduced, and the public thereby induced to purchase complete wireless receivers in precisely the same way as it purchases complete gramophones, in place of undertaking construction themselves in order to escape payment of the patent royalty.

In one form or another, the patent question is affecting the wireless trade in many countries. In Spain, Portugal, Italy, Holland, and to a less degree in France, no patent royalties are being paid, and though the two former may be regarded as non-manufacturing countries, both France and Holland are building up a considerable wireless manufacturing and exporting industry which affects the British maker both in his home market and in many other countries.

In the United States, the patent situation is at the present time the most prominent question before the trade. The patent position is mainly controlled by the Radio Corporation of America, which occupies a very similar position in this respect to the Marconi Company on this side, controlling amongst others the patents of the General Electric, the Westinghouse Electric, American Telephone, and other concerns. As a result of recent activity on the part of this company and certain actions launched by it for infringement, numbers of wireless manufacturers are now hastening to regularise the position by taking out licences under the R.C.A. patents, under which a $7\frac{1}{2}$ per cent. royalty is payable. Up to the present, it is understood that 23 of the principal set manufacturers have concluded such licences, amongst which are Stromberg-Carlson, Fada Radio, Amrad, Freshman, and Crossley. The licensed manufacturers predict that there will be a considerable reduction in the number of the "independent" or unlicensed set manufacturers in the near future, as the uncertainty of the position and the possible consequences to the trader of handling unlicensed sets are more and more stressed in wireless publicity.

Against this activity on the part of the patent holders is to be set the formation of an association of indepen-

dent manufacturers, having headquarters in Chicago, under the name of the Radio Protective Association, whose avowed object is organised opposition to all efforts on the part of the Radio Corporation of America or any other body attempting to create a monopoly, whether on account of patent claims or otherwise. The education of the public on the details of the patents claimed, their probable value, and the effect which the royalty has upon selling prices is part of the publicity programme projected, as the buying public in the United States is expected to be vigorously opposed to the higher prices for wireless sets which will result from the 7½ per cent. royalty.

In Australia also the patent question is one of the major difficulties confronting the trade. The position in this respect is mainly controlled by Amalgamated Wireless (Australasia), Ltd., a concern in which the Federal Government holds approximately half the capital, and which has the Australasian rights to Marconi, Telefunken, and other wireless patents. For several years past there has been uncertainty as to the position, as certain traders have been singled out with demands for payment of patent royalties, while others have not been approached, and British makers exporting wireless sets have paid royalties, while American makers have not. Large Australian concerns have challenged and refused to pay the patent royalties demanded, and there again the trade has organised for the purpose of testing at law the patent position.

The conditions under which the Australian wireless trade has been working have recently been the subject of an inquiry by a Royal Commission, whose findings have strongly criticised the holders of the Australian patents on the score of excessive demands upon the trade, intimating that the attitude of the company needs considerable revision, and that the charges for the use of patents in connection with receiving sets should be much reduced.

The patent position in this and other countries has resulted in a special class of wireless publicity which may be described as punitive, and "warning" advertisements on the subject of the design and construction of sets, loud-speakers, condensers, valves, &c., are rapidly becoming a feature of the trade. Whether this trend will ultimately be good for the industry as a whole or even in the true interest of the advertisers who adopt it remains to be seen, but there is undoubtedly a danger that the increasing insistence upon the importance of patent rights is apt not only to have an unsettling effect upon the distributing section of the trade, but it may also serve to increase the disposition on the part of the buying public to "home construct" all apparatus within the scope of the amateur with the object of evading all royalties.

Electric Signs.

A comparison between various types of electric signs and their usage, with some examples of Continental practice.

By CYRIL SYLVESTER, A.M.I.E.E., A.M.I.Mech.E.

FOR an electric sign to be efficient it must be outstanding in its attractiveness; it must "strike the eye" in no uncertain manner. The ideal sign, of course, is one which is equally attractive by day as by night. It should be mentioned, however, that in erecting such a sign there are many important precautions to be taken which are not generally realised. A sign of the letter type, for instance, if made of dark material, is very effective as a day sign when placed against the sky; if proper methods are adopted to illuminate it, it is also effective as a night sign. It would, however, be ineffective as a day sign if erected against the face of a dark building; the reason is the lack of sufficient contrast between the sign and the building.

Another important fact is that a sign suitable on the face of one building may not be as effective on another, although there may be the necessary contrast between letters and building. The deciding factor is whether or not there are signs of a similar character in close proximity to it. To be effective, there must be a decided and pleasing contrast between the signs themselves; a number of signs of the same make, night or day, cannot command attention to any particular one. For contrasts to be effective, although there may be decided contrasts between signs, the location of signs relative to each other must be considered. The reason for this is that where such signs are situated close together and may be effective as day signs, one may outshine the other when illuminated at night.

Such a condition is illustrated in fig. 1, where two signs are situated one above the other on the corner of a building in Rome. The upper sign is advertising an hotel and the lower one a special brand of ice cream. The hotel sign consists of a number of opal glass letters fitted in iron frames; the white letters show up very well during the day. At night the letters are illuminated by means of clear lamps situated at the back. The lower sign is of the neon type, and the letters are backed by wooden letters enamelled white; it is upon this feature that the sign depends for its attractiveness during the day. At night the words "GELATI PEPINO" are illuminated in red and the

Fig. 1.—A Bad Example of Contrast and Location.

Fig. 2.—Sign in Use in Narrow Street in Turin.

border is purple. From the illustration, which is reproduced from a daylight photograph, it may be considered that the upper sign is more attractive. This may be so during the day, but at night the lower sign shows to better advantage and completely "dwarfs" the illuminated opal letters above. Experiments have been made to increase the effectiveness of this sign when dark by fitting colour-sprayed lamps instead of the clear lamps; the results, however, have not been very satisfactory. It is obvious, in this case, that for both signs to be effective they should be removed from each other, but this is hardly possible, because one is advertising an adjacent hotel, and the other a delicacy sold by a café situated immediately below it. The solution, then, since there are only two signs, is that they should be of the same type; then their attractiveness, night and day, would be the same.

The streets in many Continental towns and cities are very narrow, which renders the signs usually fitted on the faces of buildings ineffective, due to the fact that they cannot be seen until one is almost opposite them. A letter-type sign, for instance, with the letters picked out in lamps, would not reveal the letters at all unless viewed from the front; at an angle the sign would appear as a forest of lamps. An excellent sign for a narrow street is illustrated in fig. 2; it is situated in a street in Turin. The sign is of the narrow-drum type with white sprayed lamps fitted outside the drum; the lamps are operated by a flasher, which produces a running border effect with two chasers. Inside the drum are situated a number of lamps, also connected to a flasher, which intermittently illuminate the word "CINZANO" and the bunch of grapes. The running border operates for a few seconds with intermittent flashes of the illuminated centre. The border then stops and the lamps illuminate the drum, which, with the border, remains so for about ten seconds, when animation again commences. This type of sign is very attractive, especially, as in this case, when the article advertised is depicted in the design. The sign is situated at right angles to the face of the buildings. From this it is apparent that a large number of them may, with advantage, be seen as one passes up the street; although, in a glance along a street, some signs may hide others, each one appears quite distinct as it is passed.

Fig. 3 shows a box-type sign situated in a street in Milan, and used as an attractive medium to a shop in which Persian goods are sold. It is a box-type sign with an iron frame and opal glass panels. On the panels is painted the advertising message in black, and over this are fitted neon tubes; a border of tubes is fitted round the edges of the box. The special features of this sign are that it is an excellent combined day and night sign, and that at night time it can be used

Fig. 3.—A Box-type Sign in Milan.

with two systems of lighting. In one system the neon letters are red and the border is purple; this is exceptionally attractive. The alternative system is for use if anything should go wrong with the neon lighting, or when the tubes commence to change colour; it consists of illumination from white or colour-sprayed lamps fitted in the box. The black letters painted on the opal glass show up exceptionally well with white, amber, rose or light blue illumination. The illustration is interesting from the fact that it shows the Continental method of supplying current to a sign of this character. The wiring is run on insulators on the outside of the building, and a special receptacle for a transformer is embodied in the bracket. The sign is operated by a time switch on the h.p. side so that the hours of use can be regulated.

Trailing Cables for Mines.

A comparison between some types of trailing cable at present in use, with particular reference to the important question of fault protection.

By E. P. AUSTIN, A.M.I.E.E., A.M.I.Min.E.

DEVELOPMENTS in the application of electrically-driven machinery for winning coal have brought into prominence certain specific cable problems which are peculiar to mining conditions and practice. The working conditions are severe, due to the risk of damage from mechanical causes, as well as to high initial temperature, and in many cases the existence of corrosive water.

The function of the trailing cable is to form the last link between an electrically-driven portable machine and the nearest permanent cable which terminates in a suitable gate-end box. The special rules made under the Coal Mines Regulation Act, 1911, the latest issue of which is dated August, 1924, provide that all permanent cables used on systems worked on other than low pressures must be metallically armoured, and that the armouring must contain all the conductors of the circuit, the total conductivity being at least 50 per cent. of the largest conductor enclosed by it. Further, the armouring must be earthed at the surface of the mine.

Cables used to connect up portable apparatus, *i.e.*, trailing cables, are not compelled to be armoured, but an earthing conductor must be incorporated in the construction of the cable. With this preamble the general problem of trailing cables and the construction of the various types that are in use can be usefully considered.

The insulation commonly used is v.i.r., and the outer sheathing of the cable is usually of the cab-tire type. There are a number of makes which are both insulated and sheathed with some form of special rubber compound for which the various makers claim increased flexibility, higher dielectric strength, and greater resistance to acids and alkalis, as compared with v.i.r. Experience with this class of cable indicates that it has given excellent results, and shows that improvement has been made in the use of rubber compounds.

As portable apparatus is limited by the rules to low and medium pressure, the conductor insulation rarely exceeds 0.062 in. in radial thickness. Figs. 1, 2 and 3 illustrate certain types of trailing cable, and show the thicknesses usually employed. The portable machines in mines are mainly coal cutters, face and gate conveyors, loaders, portable pumps and drills, and so on.

It is obvious that cables at the coal face are liable to

be crushed or cut by falling coal and rock, or chaffed by contact with moving machinery, and the only protection for the live conductors is a rubber sheath. Extreme weight may crush the cable and cause an internal short, and a bad twist or sharp radial bend may also lead to a similar fault. It is very difficult to prevent open sparking under these circumstances, as the weak wall of rubber forming the outer sheathing cannot withstand a disruptive arc. If inflammable gas or fine coal dust, which exists in considerable quantities in the vicinity of the coal-winning operations, is present an explosion may take place. The dangers may be obviated and the risk reduced to a minimum by taking advantage of the latest methods of construction and installing switchgear and protective methods that limit the fault current and its duration to a minimum.

The simplest form of trailer that complies with the rules is illustrated in fig. 1; it has three circuit cores and one earth core. A metallic body can pierce the insulation and make contact with a live core without operating any protective device. This is an instance of bad practice conforming with the rules. An improvement is the cable shown in fig. 2, which has a flexible copper braid or "ferflex" braiding, which is used underneath the outer rubber sheath and is earthed

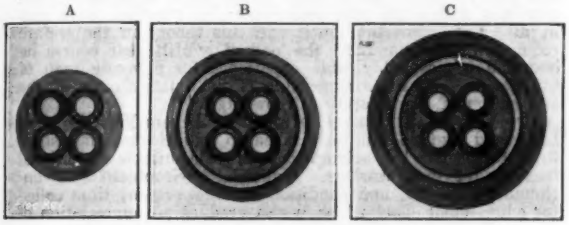

Fig. 1. Fig. 2. Fig. 3.

Section C.	Section B.	Section A.	Strand	91/·018"	·198"
			Pure and V.I.R.	·062"	·824"
			Tape	·010"	·844"
			4 Cores twisted together	—	·825"
			C.T.S.	·100"	1·023"
			Ancalite Compound	·015"	1·055"
			Tinned Copper Braid (consisting of 64 14/·0076" lay 5" bunched) Strands 16 spindles, 4 ends, 2½" lay	·068"	1·191"
			Ancalite Compound	·015"	1·221"
			C.T.S.	·100"	1·421"
			Plain Hard Cord Braid	·110"	1·641"
			Compound Black	—	1·650"

Types of Trailing Cable for use in Mines.

with the earth core. The disadvantages of this type of cable are: first, the "ferflex" breaks in the course of time with constant bending of the cable, and a fault to earth may burn through the thin copper conductors of the braiding and leave the cable in a dangerous condition, thus causing a false sense of security.

A good mechanical protection is provided for the cable shown in fig. 3. This has a hard cord braid as an outer protection, which is vulcanised in with the cab-tire sheath. Care during manufacture must be taken to prevent the cord from sinking into the rubber and touching the "ferflex" braid.

Various constructions have been tried to overcome the difficulties that have been pointed out. In fig. 4 the well-known cracore system is used as a protection against internal breakdown, with the result that the diameter is somewhat increased and the flexibility reduced. A difficulty that has arisen with trailers is to keep the cores of even length when they are made off, so as to prevent unequal strain and breakage. The cables generally untwist a little in use, and put the strain on the centre core, when such is used, but this has been largely overcome by giving the core a lay when making up, or by arranging a method of elasticity that relieves the tension.

A type of cable which has certain special features and has proved efficient in service is shown in fig. 5. In this each phase core is protected by a bare stranded conductor laid on the insulation and in contact with a bare stranded earth core in the centre. The whole is laid up in the usual manner and sheathed. When required, a fifth core is accommodated in one of the insulated fillings, or pads.

The advantages are greater flexibility, due to reduced friction between the cores, and safety from shock under all conditions. The earth shields do not easily fracture or burn through as the large area of contact and high

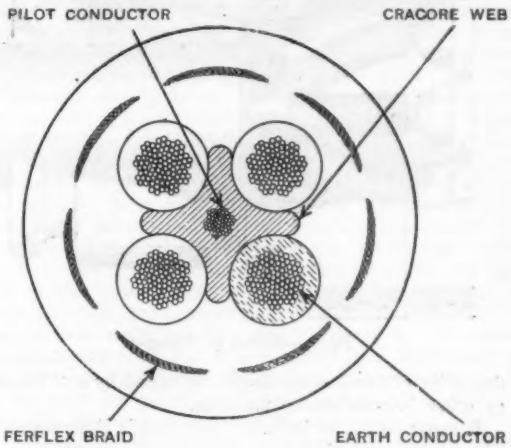

Fig. 4.—Section of Cable, showing Cracore.

conductivity of the earthing cores as a whole readily dissipate any heat that may be generated by any leakage current.

Cables for plant that is only moved slowly or infrequently may be of the semi-flexible type having three-phase cores only, and protected with wire armouring of special construction and flexibility, which must be of 50 per cent. conductivity. As an earth core is not incorporated, see fig. 7, special permission must be obtained before using cable of this kind. This also applies to the one shown in fig. 8, in which the copper

Fig. 5.—A Special Type of Cable.

envelope on each core is used as the earth core. The minimum radius to which the various cables should be bent in service is four times the cable diameter.

The conductivity of the earthing cores as a whole in all the types illustrated is higher than the rules specify, as will be seen from the following table:—

Type of cable.	Sectional area, sq. in. Power core.	Earth core.	Braiding.	Resistance of earth core per 100 yd.
4-core (fig. 1)	·0225 (Res. ·107 ohm)	·0225	—	·107 ohm
4-core (fig. 2)	·0225	·0225	·0076 (64/14)	·05 ,,
5-core (fig. 5)	·030 (Res. ·0812 ohm)	—	80/32	·036 ,,

All earth cores are in parallel with braidings.

Considerable care must be taken with repairs. It is against the rules to effect repairs of any description below ground. All repairs to the sheathing must be vulcanised. A finished joint should not be larger in diameter than the original cable. Special vulcanising tapes should be used, and the completed repair should be cured in a bath of even temperature. There are electrically-heated vulcanising baths on the market which are simple and effective in use.

"Ferflex" braiding is difficult to join satisfactorily, as soldering results in subsequent failure. A fairly successful method is to use a mat of braided copper over the joint, having a 6-in. overlap and secured by ample binders. Fig. 6 shows a method of making off at the pommell. All trailers should be subjected to routine tests in addition to the inspection that must be made,

each shift having to comply with the rules. Megger tests are suitable for the insulation only, but the con-

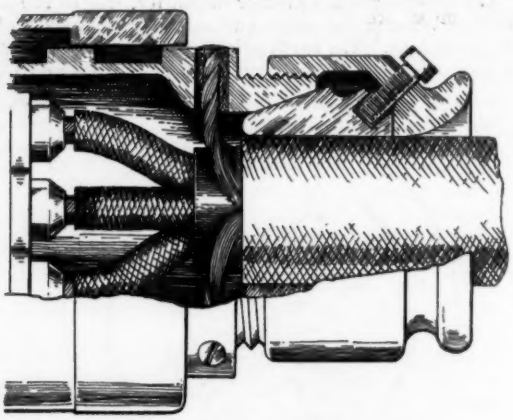

Fig. 6.—Method of Making-off.

ductivity of earth cores should be tested by a "Ductor," or other low-resistance methods.

It must be borne in mind that men's lives depend on

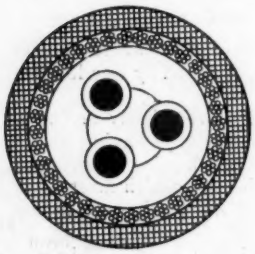

Fig. 7.

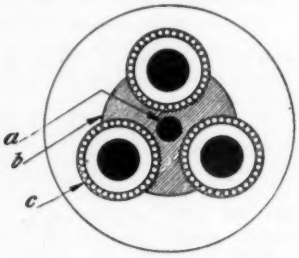

Fig. 8.

Fig. 8.	Conductor	19/7/'018=('0225 sq. in.)	
	Rubber Insulated	'062"	
	Tape	'007"	
	(c) Layer of	14/'0076"	
	(b) Cracore Web Centre	'160"	
	(a) Pilot	7/12/'0108"	
	Cab Tire Sheath	'195"	

Types of Semi-Flexible Armoured Cable.

the efficient maintenance of trailing cables, and the writer hopes that the foregoing remarks will assist in the choice and care of this important accessory.

Education and Industry.

DURING the Leeds meeting of the British Association, Section L discussed the association between education and industry. The Duchess of Atholl, D.B.E., M.P. (president of the Section), was in the chair.

Mr. T. WICKHAM MURRAY (secretary of the Association of Teachers in Technical Institutes), in a paper on "New Outlooks and Tendencies," said that to-day the technical colleges provided the best link between education and industry. Industry definitely asked for a more intimate liaison between those responsible for the country's industrial life and those responsible for technical education. With proper co-operation between educationists and industrialists, immediate advances should be affected along the lines of the grouping of educational facilities, the contents of the curricula, the supply of efficient staff, and research.

Mr. E. WALLS (Lever Bros.) said that the greatest need of industry was trained managers. The business manager had become a professional man, but whereas other professional men, such as accountants, lawyers, and so on, had a specific vocational training, the professional business organiser had not.

Mr. J. H. EVERETT (Leeds Technical College), speaking of the need for the whole-hearted support of industry, said there was a real need for more advisory committees than at present existed. He had seven advisory committees, each dealing with particular industries, such as engineering, consisting partly of employers, and partly of operatives from the trade unions and any other bodies interested in technical education in the particular industries. These met regularly and discussed the various matters connected with the training of pupils, but he was convinced that there was not sufficient of that done. There were needed not only local, but national advisory committees, and educationists were ready to meet the employers in order to be able to supply what the latter needed.

Dr. H. SCHOFIELD, in a paper on "Engineering Training in Production," said that the system of engineering production in this country was tending to change. The mass system of output was slowly but surely gaining ground, and must extend if we were successfully to meet the difficulties of world-wide competition. The mobility allowed to the average young man in modern works was small, and there was little connection between the manufacturing and the distributing sides. There was a tendency for the College or University responsible for technological training, to become dissociated from the industry for which it was responsible for training recruits. University courses in engineering and allied technology were designed, perhaps of necessity, on a mathematical and physical basis, yet for an all-round engineer there were three aspects of training, each of which was equally important. These were (1) its mathematical and physical side; (2) the question of management; and (3) the art of selling, distributing, and obtaining a market. The so-called engineering workshops in our larger technical institutions tended to become laboratories rather than workshops in the real sense of the term. Various methods of training had been introduced from time to time to deal with these difficulties. The Faraday House system embodied a very good admixture of the theoretical and the commercially practical; the works productive "bays" in large firms such as the British Thomson-Houston Co., Ltd., of Rugby, and Messrs. W. H. Allen, Sons & Co., of Bedford, gave an excellent method of keeping the student in touch with production during his years of training; the experiments in America, at Worcester and Cincinnati, were also mentioned as giving a successful method of tackling this problem.

In the productive college the student was interested, keen, and enthusiastic; he felt that he was working to some purpose and that his work had a value which could be assessed commercially within his own experience; his practical work was in direct and constant touch with his theory in the lecture room and laboratory. At the end of a fifth year course he had had a reasonably wide experience for a young man of his age, and he knew something of the relative costs of the application of his theoretical knowledge.

Mr. A. P. M. FLEMING (Metropolitan-Vickers Electrical Co., Ltd.) said that he had been asked to indicate how industrial firms themselves had attempted to provide suitable educational facilities for their workers. Industrial environment was continually changing, and conditions at the present time called for educational effort which would produce an appreciation of the need, to the community, for intensive production; the ability to work effectively in a "team"; and to exercise independent judgment based on an accurate appreciation of facts; a spirit of fairness towards one's fellows; an instinctive desire to improve the means of productive effort in the service of the community; and all the other attributes that went to the making of a good citizen. Organisations existed in some of the large industrial concerns in which the juvenile workers were not only given training facilities which enabled them to follow effectively their own particular trade or vocation, but provided the means for training in those aspects of industrial life that involved relationships with their fellows. Facilities for continuing this form of education in adult years were needed, and the most satisfactory were those which arose from the outworkings of societies and institutions which were identified with a man's work, or with the welfare of himself and his fellows. Thus, of all the healthy industrial concerns in which sports and general and social activities of every kind were being pursued very actively, the real education of fitting a man for his environment was going forward effectively. This "non-conventional" type of education must necessarily be closely linked with the more conventional training of the worker for his job and in the general, scientific, and economic principles underlying it. Instruction in economics should enable the worker to appreciate the various factors that governed raw material supply, and should enable him to exercise judgment as to the possibility offered to him by employment overseas in the development of the vast field of dormant resources that was needed to feed the fast developing manufacturing resources of the home country.

Reviews.

Dielectric Phenomena: Electrical Discharges in Gases. By S. WHITEHEAD. Edited with a preface by E. B. WEDMORE. Pp. 176; 42 diagrams. London: Ernest Benn, Ltd. Price 16s. net.

This volume, which is one of a number to be published under the auspices of the Electrical Research Association, aims, as Mr. Wedmore states in the Preface, at giving a critical *résumé* of the insulating properties of gases from the scientific standpoint. Arcs and Geissler discharges are not dealt with, except incidentally, and the treatment of liquids and solids is left for future publication. The book is written primarily for electrical engineers, but it should be of great value to radiologists. It also summarises numerous papers which are outside of the literature usually accessible to physicists engaged in research on electrical discharges through gases. The material is, moreover, presented in such a form that whilst there is continuity between theory and experiment, it is easy to make reference to any particular point, and the more important

experimental data are shown in the form of over forty diagrams.

The introduction, which deals with discharges in general, contains an exceptionally clear elementary account of the mechanics of atoms; Mr. Whitehead has not only succeeded in presenting an adequate picture of fundamental phenomena in the way that they were developed by Bohr, but has also found it possible to mention some of the attractive speculations of what has come to be known as "wave mechanics." In describing the fundamental principles of discharges, he has followed the treatment due to Townsend, and has worked in terms of coefficients of ionisation, rather than with ionisation potentials. It is interesting to note in this connection that K. T. Compton in America has adopted the same policy in recent theoretical work on the processes at the cathode of a glow discharge. In the second section, on Sparking, uniform fields and non-uniform fields are considered in turn, and the various factors which make the alternative spark-gap unreliable as a high-pressure voltmeter, such as lag and surface films, are dealt with in some detail. The third section, on Corona, is in many respects the most important, as this is almost invariably present in work at high potentials, whereas the more spectacular spark is less difficult to control. One wonders if many of the discrepancies between theory and experiment might not disappear if it were to be found that the d.c. corona were frequently intermittent, since it is now recognised that much of the older experimental work on discharges at low pressures was carried out under conditions when undetected oscillations were probably present. Some action of this sort may be a contributory factor in the production of harmonics by corona in a.c. circuits, occurring together with power losses, both of which are well summarised by Mr. Whitehead. There is an appendix of mathematical and less important matter.

It has been impossible to do more than indicate the scope of the book in a short notice of this nature, and it would be unfair under the circumstances to attempt to criticise it on minor points. It appears to us to be both complete and accurate, it is set out in a form convenient for reference, and it is eminently readable.

Navigational Wireless. By S. H. LONG, D.Sc., M.I.E.E. Pp. xi+164; figs. 162. London: Chapman & Hall, Ltd. Price 12s. 6d. net.

The importance of wireless signalling for navigational purposes has now almost reached the stage of common knowledge, but there are singularly few books on the subject as a whole, though there is a multitude of papers dealing with its technical aspect from various points of view. This is largely accounted for by the extremely rapid development which has taken place in the practical applications of the main principles which have been well known for some years. These principles are described in all text-books on radiotelegraphy, but practice has been advancing so rapidly that the fear of being quickly obsolete has put a brake on publication.

Whether the operator or the navigator should work the directional apparatus in ships is still a disputed point and there are some who say that the operator and the navigator ought to be one and the same person, but however that may be, the practice in this country at present is for the operator to take the observations and for the navigator to apply them to navigation. Dr. Long's book is intended to link up the two, so that each has a working knowledge of what the other is doing. The strictly navigational part, however, only occupies some 20 pages, consisting of an explanation of maps and the plotting of bearings, so that the great bulk of the book deals with the wireless side.

It opens with a chapter on general electricity, followed by a chapter on valves, and the remainder, with the exception of the purely navigational part, is concerned with the principles of directional wireless and their application to the navigation of ships. The principles of direction finding are described, the various systems in use are briefly explained, and a full description is given of the single frame type with especial reference to the system installed in ships by the Siemens Company. No such detailed description of single frame apparatus has previously been published.

In the description of the principles of direction finding on page 42, the author states that "the polar of the vertical effect due to the frame itself is an effect capable of rotation," and he builds up various explanations on this foundation. It seems to us that the polar of the vertical effect due to a frame of the size used in practice is not capable of rotation, and that Mr. Keen in his "Direction and Position Finding by Wireless," page 32, correctly refers to "An e.m.f. due to vertical and direct, which is independent of the angular relationship betwen the loop and the wave," &c. There is a slip on page 118 where a degree of latitude is said to represent a nautical mile.

Dr. Long has been careful to avoid any advanced mathematical expositions and has succeeded in giving us a great deal of interesting information, simply and concisely. The book is well printed and illustrated, and is a notable addition to the literature on directional radio signalling.

The Working of Aluminium. By EDGAR T. PAINTON. Pp. lx+214; figs. 64. London: Chapman & Hall, Ltd. Price 13s. 6d. net.

The subject of the present volume has assumed considerable importance in recent years, both from the purely scientific and industrial standpoints. The author has endeavoured to present in a convenient form an ordered survey of our present knowledge of the working of aluminium. This book is one more example of the modern and increasing practice of publishing treatises on single substances, or on single parts of processes; the practice arising from the need for easily accessible information which shall be both authoritative and complete. The appearance of a comprehensive volume on the working of aluminium by a British author supplies a long felt want. The aluminium metallurgical industry is well served with text-books, but reliable information on the practical workshop aspects of the subject has hitherto been somewhat scattered and inaccessible. Mr. Painton has dealt in a highly practical manner with the operations embraced within the scope of the volume, whilst the numerous line drawings and photographs add considerably to an understanding of the subject matter. One is impressed with the thoroughness with which the compilation has been made and the judgment shown in the selection and condensation of the matter. The point throughout is that of the manufacturer and the author continually treads on the solid ground of experience, showing vividly the remarkable progress made in connection with the scientific knowledge and the working of aluminium and its alloys during the last few years.

The following list of contents will serve to indicate the scope of the volume:—The general properties of aluminium sheet, aluminium casting alloys; melting and mixing; casting; oxy-acetylene welding and other jointing methods; sheet metal working; workshop practice; finishing.

The practical nature of the book may well be judged by the three concluding chapters; the one dealing with bookshop practice gives much valuable and hitherto unpublished information on the turning, screw-cutting, milling, grinding, hot forging and bending of aluminium. Much detailed information is given here by one who evidently has an intimate knowledge of the technical difficulties involved, numerous facts of practical experience being recorded. A great deal of this information has remained until now, in the private possession of the expert in the manufacture of aluminium articles, the moulding foreman and the skilled operators, and its publication therefore marks a distinct step in advance.

In the preparation of this book, the author, besides the usual sources of published information which he has freely drawn upon, has had access to information concerning many metallurgical works in England. The author is cognisant of the complexity of the subject and to the want of agreement amongst the leading authorities as to the interpretations to be assigned to the enormous mass of observed facts on the working of aluminium. The work is the fruit of a ripe experience and of devoted service in this field of scientific knowledge.

The working of aluminium and its alloys is a subject that has attracted a good deal of attention in recent years. The rise and growth of aluminium in metallurgical operations has synchronised with the development of research on the properties of the metal, together with the processes and its methods of working and treatment. With the increased knowledge of the technique, production, casting and working of aluminium to which a large amount of research is being devoted there is no doubt that it will be much more widely used in the future, particularly in the electrical, motor, and aeroplane industries. In this volume the author has entered minutely into the melting, casting, welding and working of aluminium, giving illustrations and drawings of the furnaces and the construction of the moulds used. What may be termed the accessory operations, such as the fluxes used, shrinkage, soldering, pressure welding, riveting, hot forging, &c., are also dealt with in an exhaustive manner.

The treatment of the subject is coherent and succinct, and the volume gives detailed information on a subject in which it has been lacking, much scattered information having been brought together and welded into a logical development. The literary style is concise, and the book's wide appeal and easy treatment of a highly important subject should invite an interest and be a source of inspiration to all concerned with the practical metallurgical aspects of aluminium. Those who have had experience of dealing with the publication of literature on this branch of metallurgy will recognise the vast amount of care and labour which the author must have expended on the production of the present excellent volume.

The book cannot fail to commend itself to a large circle of readers, and may very well rank as a standard work on the subject, embodying considerable chemical engineering detail; it is complete with sound metallurgical principles and withal is eminently practical.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

Liverpool Floodlighting.

During the recent Liverpool Civic Week some of the principal buildings of the city were floodlighted, and prominent among them were St. George's Hall and the Cunard Building. In both instances B.T.-H. floodlighting projectors were employed. A great deal of equipment was necessary for the illumination of St. George's Hall. The Lime Street frontage has a length of about 400 ft., required 80 reflectors, each equipped with a 1,000-W "Mazda" gas-filled lamp. In order to provide some relief, reflectors with

The Cunard Building, Liverpool.

500-W lamps were placed behind the colonnades. For the illumination of the back of the building 72 similar projectors were employed; for the St. George's Place front 20 projectors, with 1,000-W lamps, were used; and for the Art Gallery side there were 16 projectors with 1,000-W lamps and smaller ones behind the colonnades. The Cunard building floodlighting (which is illustrated in the accompanying picture) employed 30 B.T.-H. projectors, containing 1,000-W lamps and arranged in two batteries erected on low platforms at the base of the building. The projecting entrance porch was illuminated by a single projector containing a 500-W lamp.

New Falk, Stadelmann Showrooms.

On October 26th new showrooms were opened in Frederick Street, Cardiff, by Messrs. Falk, Stadelmann & Co., Ltd. There was a gathering of about 50 people, who were welcomed by Mr. Geoffrey Falk, who is in charge of the Cardiff branch. Mr. R. L. Booth, chairman of the local branch of the Electrical Contractors' Association, expressed the contractors' appreciation of the new facilities provided for them and Messrs. F. Barnard (Cardiff Electricity Department) and Mr. J. F. Thomas also spoke. The proceedings concluded with a concert by Miss Dolan Evans and party, who were thanked on behalf of those present by Mr. J. M. Bowman, electrical engineer to the Rhondda Urban District Council.

Wireless Apparatus Price-cutting.

We have received from the Wireless Retailers' Association of Great Britain a supplementary list of firms (20) who have promised to support the Association's scheme for dealing with price-cutting.

The Cost of Appliances in Melbourne.

The Melbourne *Argus* states that electrical traders in the city point out that, although recent alterations in the system of charging for electricity have made it available in nearly every part of Melbourne at an extremely low price, the people will not be able to take advantage of these low prices to any extent until there is a substantial reduction in the prices of domestic appliances. In many cases the Australian price of these appliances is twice as great as the overseas cost, because in the case of a large number of them there is an import duty of 60 per cent. One of the objects of the visit of the secretary of the State Electricity Commission (Mr. R. Liddelow) to Great Britain has been to study electrical appliance manufacture and marketing, and to investigate prices. If possible, Mr. Liddelow will report to the Commission on a means of making available general domestic apparatus more cheaply than it can now be bought. As a result of Mr. Liddelow's investigations, it is possible that the Commission will approach the Ministry with suggestions for reducing the cost of apparatus.

"Exide" Window Displays.

The Chloride Electrical Storage Co., Ltd., has awarded the following prizes in connection with its recent "Exide Week" window display competition:—First prize (25 guineas): Mr. H. Sayner, Shipley, Yorks.; second (12 guineas): Pavilion Service Depôt, Newport, Mon.; third (6 guineas): Mr. J. C. Charles, Tredegar; fourth (3 guineas): Chelston Electrical Works, Torquay. Additional prizes were awarded to the actual dressers of the windows, and there were also 25 prizes of £1 each.

A Belgian Electricity Trust.

It is reported from Brussels that the negotiations for the concentration of the Belgian production of electricity have been brought to a conclusion by the formation of an electricity trust under the leading of the Société Générale Belge d'Entreprises Electriques, of Brussels, comprising the most important firms in that country.

The North-East Coast Lighting Bureau.

Mr. E. S. Evans, district engineer of the North-East Coast Lighting Service Bureau, has recently given lectures to the following bodies:—Whitley and Monkseaton Rotary Club, the National Association of Schoolmasters, the Newcastle Display Association, the Durham Rotary Club, the Darlington Rotary Club, and the North Shields Rotary Club. These lectures were very well attended and received good reports in the local press. A reception was held at the Bureau by the Lady Mayoress of Newcastle-on-Tyne (Mrs. Arthur Lambert), for the members of the North-East Coast Branch of the Electrical Association for Women. Future engagements include lectures to the Newcastle-on-Tyne Advertising Club, the Sunderland Publicity Study Club, the North-East Coast Power Consumers, and the West Hartlepool Chamber of Trade.

The Manchester Wireless Exhibition.

The fourth Manchester Wireless Exhibition opened on October 24th and will close to-morrow (Saturday). There are over 100 standholders, who are showing the latest products of the leading radio factories. Many of the exhibitors give

The Metro-Vick Stand at Manchester.

special attention to the portable receiver capable of efficient use out of doors. Loud-speakers of every conceivable style, most of them of exceptionally artistic design, are on view. A marked line of advance is in the running of radio receivers from the electricity supply. An interesting stand is that of Metro-Vick Supplies, Ltd., which is illustrated herewith. It is illuminated by floodlighting methods.

A Useful Valve Chart.

The MARCONIPHONE CO., LTD., has produced a wall chart measuring 40 in. by 24 in., which bears particulars, curves, and prices of 22 different valves made by the company, including the indirectly heated cathode and shielded types, and transmitting and rectifying valves. The chart should prove useful to retailers in recommending the correct valves for the requirements of their customers.

Radio at the British Industries Fair.

The *Board of Trade Journal* says that a special feature of the London Section of the British Industries Fair, 1928, will be the wireless section, in which upwards of fifty representative manufacturing firms are to present an exhibit larger in size and more representative in scope than the wireless section at any previous British Industries Fair. It will be one of the largest and most comprehensive displays of the British wireless trade which will have been seen in this country. The great strides which the industry has made since 1923, the year of its inception, will be effectively shown. Overseas buyers interested in this section should pay special attention to the exhibits of the latest type of portable wireless set; of special valves adapted to work from alternating current mains; screened grid valves and gramophone pick-ups.

International Trade Fairs.

In the view of the Council of the International Chamber of Commerce, there are too many international fairs and exhibitions. A committee has been appointed to study means of reducing the number of fairs and to deal with various aspects of international displays of this kind.

Electric Power in Industry.

Preliminary Report No. 26 upon the 1924 Census of Production shows that at metalliferous mines and quarries there was 6,507 kW of electric generating plant and 12,672 h.p. of electric motors, power for 4,012 h.p. of which was purchased. Salt mines, brine pits and salt works reported 11,291 kW of generating plant (against 441 kW in 1907) and 5,006 h.p. of electric motors (power for 686 h.p. purchased). In slate mines and quarries there was 1,087 kW of generating plant and 11,530 h.p. of motors (power for 9,826 h.p. purchased). The carriage, cart and wagon trades had only 494 kW of plant, but 12,574 h.p. of electric motors, power for 12,296 h.p. of which was purchased.

New Belgian Company.

La Société Financière d'Electricité is the name of an undertaking which has been formed in Antwerp with a capital of 1,000,000 fr.

Turbo-Generator Manufacture in Russia.

The production of turbines was commenced by the "Electrosila" in 1923. From that period until September of the current year, the Trust has produced 31 turbines with a total output capacity of more than 65,000 kW; the maximum size is 5,000 kW. Arrangements have been made to construct larger turbines and towards the end of this year, sizes of 10,000 kW will be constructed. Designs are being prepared for the construction of a turbine of 22,000 kW. The turbines constructed in Soviet factories are said to be equal to the best foreign manufacture, while the cost is from 15 to 20 per cent. lower than the imported ones. The large demand for turbo-generators necessitates the extension of production of these, and the "Electrosila" is to build a large factory for their production. The new works are to produce about one hundred turbines a year, and will be capable of manufacturing turbines of 10, 20, 30 and 40 thousand kW. The machinery is to be imported from abroad. The buildings are already under construction and the first factory is to be started on January 1st, 1929. Since 1923 the "Electrosila" has built four large generators of an average of 8,750 kW for the Volkhov undertaking and four generators averaging 6,400 kW for the Zemo-Avchalsk undertaking. At present the factory is engaged in the construction of two 3,750-kW hydro-electric generators for the Batum station. The Trust is also preparing designs for the construction of new generators for the Dniepr, Svir and Neva hydro-electric undertakings.

New Italian Companies.

Among the companies recently formed in connection with electricity supply in Italy are the Società Elettrica Libari, Castrovillari; La Società Elettrici Suburbana Milanese, Milan, capital 1,000,000 lire; La Società Elettrica delle Madonie, Petralia Soprana, capital 3,000,000 lire; La Società Idroelettrica Tirrena, Rome, capital 500,000 lire; and La Società Idroelettrica Alpi Cozie, Turin.

Unemployment in Germany.

The Berlin correspondent of *The Times* states that the latest German unemployment returns show another considerable reduction. The number of unemployed in receipt of ordinary relief decreased during the first half of October by 26,000, or 7.3 per cent., from 355,000 to 329,000. The extended benefit returns, published monthly, show a decrease of 23,000 from 136,000 to 113,000, between September 15th and October 15th. During the whole month from September 15th to October 15th the total number of persons in receipt of relief in both categories fell by 75,000, or 14.5 per cent., from 517,000 to 442,000.

Berlin Loan for Extensions.

Details of the purposes for which the Berlin Municipality seeks authorisation to borrow £6,000,000 are given by the Berlin correspondent of *The Times*. It is proposed to spend 31,000,000 marks (£1,550,000) on the extension of electric railways, especially an underground line from the Alexanderplatz to Lichtenberg and Friedrichsfelde. When the Foreign Loans Committee authorised the London loan, it deleted 25,000,000 marks (£1,250,000) for tramways. This the city proposes to take out of the new loan. The capital of the aerodrome company is to be raised by 400,000 marks (£20,000); 40,000,000 marks (£2,000,000) is required for electric power stations and cables, 10,000,000 marks (£500,000) for waterworks, and 2,500,000 marks (£125,000) for the extension of the already extensive exhibition grounds.

Dissolution of Partnership.

S. DUNCAN & Co., county distributors of electrical goods, 33, Market Street, Watford.—Messrs. A. G. Lawrence, S. Duncan and M. Duncan have dissolved partnership.

United States Electrical Exports.

The preliminary figures of the United States foreign trade during August give the total value of electrical exports as $8,139,241, as compared with $7,026,762 in August, 1926. The principal class contributing to this increase was transforming and converting apparatus; the exports of rectifiers, motor-generators, synchronous convertors, and similar machinery rose by over $200,000. Other important increases occurred in storage batteries ($106,000), unspecified telephone equipment ($130,000), fractional h.p. motors ($125,000), and flashlights ($100,000). There were also a number of large decreases, including telephone switchboards ($182,000), radio receiving sets ($120,000), and switches and circuit breakers over 10 A ($84,000). The total value of exports for the first eight months of the year was $65,145,935, a gain of $2,107,243 as compared with the corresponding period of 1926. The United Kingdom's share of the August exports is given as $546,167, a figure exceeded only by Canada ($1,616,624) and Australia ($824,051). It is stated that the United Kingdom was the largest purchaser of motor-driven household devices, excluding fans and washing machines. The British Empire took 70 per cent. of the motor-driven devices and 50 per cent. of the heating and cooking class. The United States' imports of electrical goods during August were valued at $275,824, Great Britain's share amounting to only $16,226, mainly radio apparatus.

Indian Electrical Imports.

The imports of electrical machinery into India during July last attained a value of 3,800,000 rupees, as compared with 2,376,000 rupees in the corresponding month of 1926.

The E.D.A. Circle Campaign.

An all-electric demonstration house has been opened by the Edinburgh Circle. The house consists of dining-room, drawing-room, bedrooms, nursery, kitchen, and bathrooms, and is priced at £2,300, including electric wiring, &c. It is expected that 25,000 people will inspect the house, the efficient equipment of which is the result of the fine spirit of co-operation among all sections of the electrical trade in Edinburgh.

No. 3 of "The Cedac Bulletin" makes a final report upon the inaugural luncheons which secured for the Campaign 2,624 inches of editorial space in 160 newspapers and journals, representing a total circulation of nearly 16 millions. It is stated that 420 supply undertakings and contractors have notified their intention to participate in the National Electric Week in December. A list of newspapers is given, with particulars of the campaign advertisements which are appearing.

"Exide" Batteries at the Scottish Motor Show.

The exhibit of the CHLORIDE ELECTRICAL STORAGE CO., LTD., at the Scottish Motor Show comprises "Exide" batteries in a profusion of types, with several notable additions to the range in monobloc containers. Batteries are exhibited cut away to show their construction, and the various component parts, grids, plates, separators, &c., are shown separately.

Diploma for Lamp Locks.

At the recent International Exhibition of Inventions, Mr. J. A. Brook, Huddersfield, was awarded a diploma of merit for his electric lamp locks for use with ordinary and Home Office-type lampholders.

Social Events.

The A.T.M. Dramatic Society, assisted by the A.T.M. Orchestral Society, the latter being under the direction of Mr. C. Brandreth, gave a combined performance at the Balfour Institute, Liverpool, on October 18th. The programme consisted of three playlets and an overture and selections by the orchestra. Both performances were of a high standard and reflected great credit on the artistes, producer, and conductor.

Messrs. Johnson & Phillips, Ltd., held their first staff dance of the season at the Woolwich Town Hall on October 21st. Over 250 members of the staff and their friends were present.

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Trade Announcements.

MESSRS. HUBERT JONES have formed an associate company under the style of the Trafford Park Tubes and Fittings Co., which is controlled from their King Street Warehouses, Bury. They have taken over works at the Lake, Trafford Park, Manchester, and are carrying stocks of fittings and tubes.

MR. E. E. BEAVEN, of 16 and 18, High Street, Dartford, who is closing down his ironmongery business, announces that the electrical department will be carried on by the same staff under the supervision of Messrs. A. Ling & Co., Ltd., of 138, Fetter Lane, London, E.C.

New Catalogues and Lists.

The EDISON SWAN ELECTRIC CO., LTD., 123-125, Queen Victoria Street, E.C.4.—A neat binder containing thirteen catalogues dealing respectively with lamps, accumulators, silk shades, "unit" lighting, heating and cooking apparatus, instruments and meters, radio equipment, dry and fluid batteries, electrical accessories, house-lighting accumulators, induction motors, d.c. motors and fans. Also a decorative lighting fixtures catalogue, a price list of wires, cables, and flexibles, and an illustrated instructional pamphlet and a blue print relating to the new "R.C. Threesome" receiving set.

MESSRS. A. H. HUNT, LTD., Tunstall Road, Croydon.—Catalogue 57, consisting of a number of leaflets in a single binding dealing with all types of "Hellesen" dry batteries, portable lamps, hydrometers, insulating tape, &c. Fully illustrated and priced. Also a catalogue of "Hellesen" dry batteries and a copy of a "Service conditions note," which is packed with every "Hellesen" h.t. radio battery.

MESSRS. MAVOR & COULSON, LTD., 47, Broad Street, Mile End, Glasgow.—Pamphlet No. 261/5, illustrating the company's ironclad control pillars; and Price List No. 291/1, dealing with colliery lighting fittings.

PHILIPS LAMPS, LTD., 145, Charing Cross Road, W.C.2.—A priced catalogue of "Argenta" lighting fittings for outdoor and indoor lighting. A table of illumination intensities for various services is included. Also Leaflet No. 300, describing (with prices) the company's Christmas-tree lighting outfits.

COVENTRY ELECTRICAL APPLIANCES, LTD., Conduit Yard, Fleet Street, Coventry.—A blotter giving prices of the company's switchplates and boxes for flush switches. Also particulars of bowl fires with plug-in elements.

MESSRS. AUSTIN WALTERS & SON, LTD., Little Peter Street, Manchester.—A catalogue containing illustrations of a great many of the company's electric signs and particulars of sign controllers. Another section illustrates and describes lighting and other apparatus for theatres, dance halls, &c. Fully priced.

BRITISH B.A.G., LTD., 23, Farringdon Road, E.C.4.—A priced and illustrated pamphlet advertising the company's industrial lighting fittings.

THE HOBART BROS. CO., Box MS.7, Troy, Ohio, U.S.A.—An illustrated booklet advertising the company's battery-charging equipment, lathe attachments, air compressors, &c.

MESSRS. YOUNG, OSMOND & YOUNG, LTD., 47, Victoria Street, S.W.1.—A brochure on heating and ventilating by electricity, describing the company's "Unity" tubular heating system. Interesting photographs of actual installations are reproduced, and some useful technical data is included.

POWER CONTRACTS, LTD., 138 & 140, Southwark Street, S.E.1.—A brochure dealing with the company's work, which includes the installation of power plant, cables, overhead lines, the changing over of schemes of supply, &c.

THE BRITISH RESISTOR CO., LTD., Clare Road, Halifax.—An illustrated pamphlet describing the "R.D.40" electric furnace for the heat treatment and forging of rock drill steel.

ELECTRICAL UTILITIES, LTD., Tudor Works, Park Royal, N.W.10.—Leaflet F, an illustrated and priced description of the "Rose" triangular electric fire.

THE MIRRLEES WATSON CO., LTD., 45, Scotland Street, Glasgow.—Publication Pu. 709, containing an illustrated description of the "Mirrlees-Delas-Ginabat" condenser for land and marine services.

POPE'S ELECTRIC LAMP CO., LTD., 5, Arthur Street, New Oxford Street, W.C.2.—Folder 4,516, containing prices of "Elasta" gasfilled and vacuum lamps.

TUNGSRAM ELECTRIC LAMP WORKS (GREAT BRITAIN), LTD., 72, Oxford Street, W.1.—A leaflet, in colour, advertising the company's "D"-type lamps.

MESSRS. J. H. TAYLOR & CO., Macaulay Street, Huddersfield.—A "Wireless Guide," giving prices of radio components and accessories of many makes. A supplement contains prices of electrical materials and appliances.

BRITISH INSULATED CABLES, LTD., Prescot, Lancs.—Catalogue P.222, illustrating and describing "Prescot" disconnecting network boxes.

MESSRS. FERRANTI, LTD., Hollinwood, Lancs.—Pamphlets Wa 406, dealing with the company's radio meters, and Wa 411/4, containing battery eliminator diagrams.

THE WHOLESALE FITTINGS CO., LTD., 23, Commercial Street, E.1.—Supplement 202, containing illustrations and prices of several examples of the company's "Altolite" glassware fittings—bowls and shades.

THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—Catalogue "X and Y" Section, containing illustrated details and prices of ironclad switchgear and fuses of many patterns.

THE TUDOR ACCUMULATOR CO., LTD., 2, Norfolk Street, Strand, W.C.2.—A very comprehensive catalogue of the company's batteries for heavy-duty. Special types for central-station work, telephone exchanges, country houses, railway purposes, &c., are dealt with and a great deal of technical data is given.

THE BRITISH THOMSON-HOUSTON CO., LTD., Crown House, Aldwych, W.C.2.—A poster announcing the introduction of three new radio valves with filaments of specially-treated nickel. Priced. Also a well-illustrated catalogue of "Mazda" lamps of all types.

We have received a copy of the October number of *Concord*, the organ of the LIVERPOOL BORAX COMPANY, FEED WATER SPECIALISTS CO. and ANDREW MAXWELL, of St. Paul's Square, Liverpool.

Bankruptcy Proceedings.

STEPHENS & WEILL, cycle and electrical accessories merchants, late of 55, Great Eastern Street, E.C.—The receiving order in this case was made on August 18th at the London Bankruptcy Court, and accounts have been lodged showing liabilities of £23,564, against assets expected to realise £4,409.

F. A. WILLIAMS, electrician, 96, Churchill Road, Great Yarmouth.—Receiving order made October 21st on debtor's own petition. First meeting, November 4th, at the Official Receiver's office, 9, Queen Street Chambers, Norwich. Public examination, November 24th, at the Town Hall, Great Yarmouth.

R. H. NICHOLSON (W. Nicholson), decorator and electrician, 8a, High Street, Mexborough.—First meeting held November 3rd at the Official Receiver's offices, Figtree Lane, Sheffield. Public examination December 1st, at the Court Hall, Sheffield.

C. W. WATSON, electrical and wireless engineer, 33, Rainhall Road, Barnoldswick, Yorks.—Trustee, Mr. J. O. Morris, Official Receiver, 12, Duke Street, Bradford, released October 13th.

J. A. TREND, electrician, 31, Chapel Street, Luton.—Trustee, Mr. T. Keens, 11, George Street West, Luton, released September 1st.

M. KELLY, radio apparatus dealer, 12, Jackson's Row, Manchester.—Last day for proofs for dividend, November 12th; trustee, Mr. J. F. Warburton, 28, Queen Street, Manchester.

P. F. BRITTAIN, electrical engineer, Norfolk Hotel, Folkestone, and 110, Cannon Street, E.C.—Application for discharge to be heard November 16th, at Carey Street, W.C.

I. J. LITHAUER, director of a private company dealing in wireless instruments and accessories, 10, Duke Street, Adelphi, W.C.—Receiving order made October 26th, on a creditor's petition.

H. C. WINGFIELD, electrician, 47, Carholme Road, Lincoln.—Receiving order made October 24th, on debtor's own petition.

Company Liquidations.

SERENADA MANUFACTURING CO., LTD., 22, Paper Street, E.C.—Under the compulsory liquidation of this company the report of Mr. J. Barwick Thompson, Assistant Official Receiver and liquidator, shows liabilities of £3,205, assets "nil," and a total deficiency of £4,205 with regard to contributories, the issued capital being £1,000. Mr. Thompson reports that the company was registered in December, 1924, with a nominal capital of £1,000, to carry on business as manufacturers of and dealers in loud speakers and radio components. The first and only directors of the company were S. H. Abrahams and his wife. Abrahams purchased a considerable quantity of parts for making up into loud speakers, the cost of which was approximately £2,000. This stock appears to have been handed over to the company and Abrahams' account credited from time to time as the goods were disposed of. The company's books disclose that finance was provided by way of loans made by Abrahams and at the date of the winding-up order he was a creditor for £3,133. Abrahams says that he has personally satisfied all the outstanding liabilities with the exception of that due to the petitioning creditor, who had refused an offer. According to accounts as at December 31st, 1925, the trading resulted in a gross profit of £377 on sales amounting to £3,316. There was, however, a net loss of £1,289. A draft balance sheet and accounts covering the period from January, 1925, until April, 1927, show a net loss of £2,916. Abrahams attributes the loss to the fact that a number of the loud speakers were sold under cost, as it was impossible to find a market for them. In April, 1927, the company ceased to carry on business and the lease, together with the fixtures and fittings, was sold for the sum of £38. The failure of the company is attributed by Abrahams to the lack of demand for the loud speakers, which was due to the fact that the company never had sufficient capital to advertise the loud speaker sufficiently.

REFLEX RADIO CO., LTD.—First and final dividend of 3s. 0½d. in the £, payable at Carey Street, W.C.

ARIES BATTERY CO., LTD.—Winding up voluntarily. Liquidator, Mr. T. Dudley Cocke, Leith House, 47, Gresham Street, E.C.

COGENT ELECTRICAL CO., LTD.—A meeting of members is called for November 29th, at the offices of Messrs. Bryce,

Hanmer & Co., 24 and 26, North John Street, Liverpool, to hear an account of the winding up from the liquidator, Mr. B. N. Hanmer.

TECHNOLOGICAL INSTITUTE OF GREAT BRITAIN, LTD.—A petition has been presented by an unsecured creditor for the compulsory winding up of this company.

Private Arrangement.

THOMAS GUNN, LTD., 30, Fore Street, E.C.2, 30, Eastcheap, E.C.3, 52, Copthall Avenue, E.C.2, 78, Queen Street, E.C.4, and 23, Forston Street, N.1, ironmongers, electricians, &c.—A conference of the principal creditors was held recently, at the First Avenue Hotel, E.C. The chair was occupied by Mr. F. H. Bennett, 59, Chancery Lane, E.C., who reported that the company had passed the usual resolution in favour of voluntary liquidation, and had appointed him to act as liquidator. Mr. Clark had been appointed to act as receiver for the debenture holders. The directors, however, desired to consult the principal creditors at once with a view to reconstructing the business. The chairman read a statement which disclosed liabilities of £25,928 (trade creditors £18,651), and assets of £12,496. There were also leases of certain of the premises which might be of value. The company was registered in August, 1907, with a nominal capital of £12,000, and took over a business which had previously been carried on by Mr. Thomas Gunn. In 1910 the capital was increased to £15,000. The vendor was paid £9,000 for the assets in ordinary shares. With that exception all the remaining issued capital had been allotted for cash. There were debentures of £5,000, £4,000 being held by Mr. Willis and the remainder by Mrs. Gunn. A suggestion was made that creditors under £20 should be paid an amount in cash in full discharge of their claims, and that the other creditors should receive 2s. in the £ in cash, payable as to 1s. in six months and 1s. in twelve months; 4s. in the £ by way of second debentures to carry interest at 5 per cent. per annum, payable out of future profits; and a further 6s. in the £ in second debentures to be redeemed as and when possible. The company had recently incurred a heavy loss in connection with a patent which it had been financing. During the twelve months to August, 1923, there was a net profit of £734, and in the following twelve months a net profit of £250. It was suggested that the first debenture holders should stand aside under a reconstruction scheme until the trade creditors had received 1s. in the £ in cash, and a further 1s. in six months, together with second debentures to the value of 4s. in the £. The creditors expressed the opinion that a scheme of reconstruction would be preferable to a realisation which might mean the ultimate breaking up of the business.

British Radio Exports.

The *Wireless Trader* reports that during August radio apparatus to the value of £76,551 was exported from this country; valves accounted for £10,940 of the total. The principal buyer was Australia, whose share was valued at £16,260 (valves £1,252). South Africa came second with £7,169 (valves £1,738), the Netherlands took £6,458 (valves £53), and France £4,399 (valves £353).

Battersea "Electric House."

The Mayor of Battersea formally inaugurated the new showrooms of the Electricity Department on October 29th, in the presence of a distinguished gathering, which included Sir Andrew Duncan, chairman of the Central Electricity Board, and Major C. R. Attlee, M.P. Sir Andrew congratulated the Electricity Committee on having secured such a mansion from the Council. He stated that any success that might attend the Central Electricity Board's efforts to organise generation would depend on the success of means for distribution and sales. Major C. R. Attlee, who also congratulated the Council on its enterprise, said that there had been a tendency to think too much of generating electricity and not enough of selling it, but that every municipal electricity committee had now to consider how to increase its sales. In its new showrooms the Council had the finest possible advertisement.

We hope to make further reference to the showrooms in our next issue.

For Sale.

Bedford Corporation Electricity Department has for disposal one 1,000-kW mixed-pressure turbo-alternator and condensing plant. Mr. H. J. Shaw will sell by auction on November 10th, at 13, High Holborn, W.C.1, various stocks of wireless and electrical goods. (See our advertisement pages to-day.)

Book Notices.

"Modern Picture Theatre Electrical Equipment and Projection." Second edition. By R. V. Johnson. Pp. xii+189; figs. 28. London: Crosby Lockwood & Son.—Of the additions which have been made to this work to bring it up to date, the new section on water supply should be of special interest, particularly to those concerned with the planning of theatres.

"Electric Circuit Theory and Calculations." Third edition By the late W. Perren Maycock, M.I.E.E. Revised by Philip Kemp, M.Sc. Pp. xiv+355; figs. 119. London: Sir Isaac Pitman & Sons, Ltd. Price 10s. 6d. net.—The plan of the book has been left unaltered in its revised form, but certain alterations have been made to bring the work up to date. The two chief features in this connection are the introduction of the gasfilled lamp and the new nomenclature in connection with sizes of wire.

"Applied Thermodynamics." By Prof. W. Robinson, M.E. London: Sir Isaac Pitman & Sons, Ltd.—This work is intended for students preparing for any of the following examinations: National Certificate, A.M.I.Mech.E., A.M.Inst.C.E., and B.Sc.(Eng.). It is being issued in 12 weekly parts, price 1s. each.

"Strength of Materials." By F. V. Warnock, Ph.D. London: Sir Isaac Pitman & Sons, Ltd.—This work, which is intended for students preparing for the National Certificate, A.M.I.Mech.E., A.M.Inst.C.E., or B.Sc.(Eng.) examinations, is being issued in eight weekly parts, price 1s. each.

"Performance and Design of D.C. Machines." By. A. E. Clayton, D.Sc. London: Sir Isaac Pitman & Sons, Ltd.—This book, which is being issued in nine weekly parts, price 1s. each, is intended for students preparing for any of the following examinations: National Certificate, City and Guilds, A.M.I.E.E., and B.Sc.(Eng.).

"The Electrical Contractors' Year Book, 1927-28" (442 pp.). London: The Electrical Contractors' Association (Inc.). Price 5s.—The principal addition to this year book is a 33-page index of "Central Stations of the United Kingdom" (which, by the way, includes a list of undertakings in the Irish Free State). This gives the name of each authority, the chief engineer's name, and the system and voltage of supply. Other new matter is the presidential address and a report of the proceedings at the second annual conference, at Scarborough.

"A Study of Radio Direction-finding." Pp. 37; graphs and maps 15. London: H.M. Stationery Office. Price 1s. 9d. net.—This Special Report No. 5, by Dr. R. L. Smith-Rose, summarises the progress that has been made in the investigations into radio direction-finding, particularly the "night effect," that have been carried out under the auspices of the Directional Wireless Committee of the Radio Research Board during the last five years comprehensively; information obtained during the last two years is added, and a theoretical discussion indicates how the study of the subject has contributed to the solution of the problem of the propagation of wireless waves round the earth.

"Electricity for Victoria." Pp. xix+92; fully illustrated. Melbourne and Sydney: The Tait Publishing Co., Pty., Ltd. Price 5s.—This publication, which is issued with the full approval of the State Electricity Commission of Victoria (Australia), and has been prepared with the co-operation of technical officers of the Commission's staff, contains a complete account of the undertakings and operations of the Commission. From the winning of the brown coal at Yallourn, its utilisation is traced to the generation and transmission of electricity throughout the State. Full technical descriptions, with excellent illustrations, are given of the generating stations at Yallourn and Newport, the Yallourn-Melbourne high-pressure transmission line, the Yarraville terminal station, and the transmission and distribution systems throughout the State. In addition, special articles are devoted to the high transmission towers employed for crossing the River Yarra, the Sugarloaf-Rubicon hydro-electric development, the brown coal briquette factory at Yallourn, and others deal with subsidiary activities and future developments.

Bulletin of the British Cast-Iron Research Association, No. 18. October, 1927.

Scientific Papers of the U.S.A. Bureau of Standards. No. 560, Density and Electrical Properties of the System, Rubber-Sulphur. Price 15 cents.

"Electric Winders," by H. H. Broughton. Pp. xxii+402; 288 figs. London: Ernest Benn, Ltd. Price 52s. 6d.

University of London, University College. Calendar for the session 1927-28. London: Taylor & Francis.

"Science Abstracts" (A. and B). Vol. XXX. Part 10. October 25th, 1927. London: E. & F. N. Spon, Ltd. Price 3s. each.

New Zealand Duty on Vacuum Cleaners.

The New Zealand Government has abolished the 20 per cent. duty on imported British vacuum cleaners and has lowered the "general" rate from 35 to 20 per cent. *ad valorem*.

New French Companies.

Among the electricity supply undertakings recently formed in France are the Compagnie d'Electricité Loire et Nievre, organised in Paris (73, Boulevard Haussmann) with a capital of fifteen million francs, and the Société d'Electricité de Cette et Frontignan (21, Rue St. Guilleaume, Paris), capital six million francs.

Preference for Australian Electrical Plant.

The Melbourne *Argus* reports that the Victorian Electricity Commission recently accepted the tender of Thompson's Engineering and Pipe Co., of Castlemaine, Vic., for an 18,750-kW turbo-generator at £47,885. The lowest British tender was £9,250 less, but whereas the accepted tender provided for the expenditure of £28,831 in Australia, the British offer included Australian expenditure of only £13,980. It is stated that the acceptance of the higher tender will increase the Commission's costs by £500 per annum. Commenting on the matter, *The Australian Manufacturer* says:—"It is sound economy from the national point of view, as although the cost is £9,000 more, it keeps £14,851 more in the country, which is a national saving. It really matters nothing to Australia or Victoria as

a whole, whether the £14,851 in the bank is credited to the name of the Electricity Commission or the Thompson Company—the vital fact is that it *is* there, to be used in the production of wealth, to provide employment and to pay wages. If it is spent abroad, then Australia is the poorer by its loss."

Recent Contract.

The BRITISH THOMSON-HOUSTON CO., LTD., has designed, and is supplying the fittings and lamps for, a new floodlighting installation at Selfridge's, Oxford Street. This, it is claimed, will be the largest installation of its kind in the United Kingdom.

Prices of Raw Materials.

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, &c.	Price November 1st	Fortnight's inc. or dec.
a	Acid, Oxalic ... ... per lb.	5¾d.	...
a	Ammoniac, Sal ... ... per ton.	£60	...
a	Ammonia, Muriate (large crystal) ,,	£52	...
a	Bisulphide of Carbon ... ... ,,	...	...
a	Borax ... ... ,,	£25	...
a	Copper Sulphate ... ... ,,	£25 10s.	...
a	Potash, Chlorate ... ... per lb.	4d. to 4½d.	...
a	,, Perchlorate ... ... ,,	5½d.	...
a	Shellac ... ... per cwt.	£13 10s.	...
a	Sulphur, Commercial ... ... ,,	£11	...
a	,, Roll ... ... ,,	£11	...
a	Soda, Chlorate ... ... per lb.	3¼d. to 3½d.	...
a	,, Crystals ... ... per ton.	£5 to £5 5s.	...
a	Sodium Bichromate, casks ... per lb.	3¼d.	...
	METALS, &c.		
b	Aluminium, Ingots ... ... per ton.	£107 to £112	...
b	,, Wire ... ... per lb.	1/6 to 2/-	...
b	,, Sheet ... ... ,,	1/3 to 2/9	...
p	Babbitts Metal and Anti-friction Metal—		
	Grade I ... ... per ton net.	£234	...
	Grade II ... ... ,, ,,	£162	...
	Grade III ... ... ,, ,,	£85	...
c	Brass (rolled metal 2" to 12" basis) per lb.	9¾d.	...
c	,, Tubes (solid drawn) ... ... ,,	11¼d. to 11¾d.	...
c	,, Wire, basis ... ... ,,	9¾d.	...
c	Copper Tubes (solid drawn) ... ,,	1/0½	...
c	,, Bars (best selected) ... per ton.	£86	...
c	,, Sheet ... ... ,,	£86	...
c	,, Rod ... ... ,,	£86	...
d	,, (Electrolytic) Bars ... ,,	£62 17s. 6d.	2s. 6d. inc.
d	,, ,, Sheets ... ,,	£143 10s.	...
d	,, ,, Wire Rods ,,	£72 17s. 6d.	2s. 6d. inc.
d	,, ,, H.C. Wire per lb.	9⅞d.	...
f	Ebonite Rod ... ... ,,	2/3 to 2/6	...
f	,, Sheet ... ... ,,	2/3 to 2/6	...
n	German Silver Wire ... ... ,,	2/2	...
h	Gutta-percha, fine ... ... ,,	8/-	...
h	India rubber, Para fine ... ... ,,	1/2½	½d. inc.
l	Iron Pig (Cleveland No. 3.) ... per ton.	75/-	...
l	,, Wire, galv. No. 8, P.O. qual. ,,	£21	...
g	Lead, English pig ... ... ,,	£22 5s.	...
g	Mercury ... ... per bot.	£22 17s. 6d.	2s. 6d. inc.
e	Mica (in original cases) small ... per lb.	3d. to 3/-	...
e	,, ,, medium ,,	4/- to 8/-	...
e	,, ,, large ... ,,	10/- to 20/- & up.	...
p	Phosphor Bronze, plane castings ,,	1/3½	...
p	,, ,, drawn bars & rods ,,	1/3	...
p	,, ,, rolled strip & sheet ,,	1/2½	...
p	,, ,, wire... ... ... ,,	1/3½	...
o	Platinum ... ... per oz.	£14 10s.	...
d	Silicium Bronze Wire ... ... per lb.	10½d.	...
r	Steel, Magnet, in bars ... ... ,,	7½d.	...
n	Tin, Block (English) ... ... per ton.	£259 to £259 10s.	£3 dec.
n	,, Wire, Nos. 1 to 16 ... ... per lb.	4/2	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Unemployment.

During the week ended October 17th the number of registered unemployed decreased by 1,700. The total was 1,071,300, as compared with 1,073,000 on October 10th, and with 1,520,475 on October 18th, 1926 (coal dispute period).

Trade with Esthonia.

The *Chamber of Commerce Journal* states that when the whole of the water power of the Narva Falls, Esthonia, estimated at 90,000 h.p., is fully employed, large quantities of electrical appliances will be required. At present it is only utilised to the extent of about one-tenth. The use of electricity, however, is increasing generally, and with it the demand for electrical goods. Last year imports of electrical goods of all kinds were valued at 120.2 million Emks., of which Germany supplied no less than 80.4 per cent. Since the establishment of a wireless station at Tallinn (Reval), there has been a lively demand for wireless apparatus and parts. Great Britain has taken a prominent part in this trade, and there appears to be no reason why it should not be further extended. Although permits are required for the importation into Esthonia of wireless sets and parts, there would appear to be no difficulty in obtaining such permits.

Public Lighting Engineers.

Mr. W. J. Liberty, the honorary secretary, announces that the title of his association is now the Association of Public Lighting Engineers, and the address has been changed to 68, Victoria Street, London, S.W.1.

Lighting and Power Notes.

Alton.—STREET LIGHTING.—Electricity is now available in all the principal streets of the town, about six miles of cable having been laid from the new power station.

Bedford.—HIRE-PURCHASE SCHEME.—The Corporation Electricity Committee has prepared a scheme for the hire and sale of apparatus on the hire-purchase system.

Blackpool. — AUTUMN ILLUMINATIONS. — For the autumn illuminations which lasted 31 days, the number of kWh required totalled 175,000. A charge of 1d. per kWh is to be made for electricity supplied in connection with the scheme.

LOANS SANCTIONED.—The Corporation has received sanction to the borrowing of £2,750 for a new building for tramway stores; and £41,000 for Preston-Blackpool transmission lines, comprising: Mains (underground), £10,000; mains (overhead), £20,000; plant (transformers and switchgear), £11,000.

Brighton.—LOAN SANCTIONED.—The Corporation Electricity Committee has received sanction to the borrowing of £11,000 for mains and services.

EXTENSION OF BUILDINGS.—The Committee has approved estimates of the engineer for extensions to buildings at Southwick power station, at a total cost of £32,000.

China.—PEKING.—The Peking Electric Light Co., Ltd., is to change all the street overhead lines to underground cables in order to minimise danger.

Continental.—CZECHO-SLOVAKIA.—Good progress is being made with the erection of the Schreckenstein hydro-electric power station on the River Elbe near Aussig. The plant, which is to be equipped with plant having a total of 20,000 h.p. will, when completed, be the largest so far constructed in Czecho-Slovakia.

Coventry.—LOAN.—The Corporation Electricity Committee is applying for sanction to the borrowing of £7,000 for mains.

Dorking.—STREET LIGHTING.—The Urban District Council has decided to enter into a 14-years contract with the local electricity supply company to light the town with electricity.

Elland.—WIRING OF SMALL HOUSES.—The Urban District Council, last week, approved a recommendation of the Electricity Committee for the wiring of houses without charging the initial cost to the owner. The consumer will be required to pay 1d. per kWh advance on the ordinary lighting rate until an agreed number of kWh has been consumed.

Exeter.—ELECTRICAL DEVELOPMENT.—A report on the electricity undertaking, together with recommendations for further extensions at the power station at an estimated cost of £37,500, was presented by the borough electrical engineer (Mr. H. D. Munro) to the City Council on October 25th. He stated that the main portions of the new plant were practically completed and the minor details were now being dealt with. He hoped to commence preliminary runs of this plant within the next month. The sub-stations for the Crediton supply were completed, but very little of the special switchgear and apparatus, either at Crediton or Exeter, had yet been delivered and erected by the makers. Meanwhile a temporary supply from the existing mains had been arranged, and electricity was switched on to Crediton on October 8th. The extension now approaching completion formed part of a scheme approved in 1924 to provide for the normal growth of the undertaking and for the loss in capacity of the older plant involved in the change in frequency of the supply. The output and maximum load had advanced by nearly 25 per cent. since last year, and the maximum load in 1928 would exceed 4,000 kW, which was the maximum that should be carried by the plant with due provision for reserve. He therefore recommended that application be made for consent to extensions, including a 3,750-kW steam turbo-alternator in the place of the two reciprocating sets of 800 kW total capacity, which were now obsolete, together with two 25,000-lb. boilers in place of two existing boilers of half that capacity.

Gale and Flood Damage.—It is reported that during the gale last week-end, the partially-constructed sea wall at Fleetwood was washed away by the abnormal tides, and the town, including the power station, was flooded, with the result that most of the town was without light. All means of transport by rail, tramcar, and road were cut off, and works using electricity were at a standstill.

The arrangement between Blackburn and Preston Corporations for an interchange of electricity in case of emergency was brought into practical operation as a result of the gale, which struck two water-cooling towers at Blackburn power station, throwing them heavily against two others, and the four collapsed. The main circulating pipe was broken as a result, and the large volume of water flooded the station to a depth of several feet. It was found necessary to stop the machinery and the station switched over to the Ribble headquarters at Preston. It was very fortunate that the

mishap occurred at a time when the load was at its lowest. The staff worked at high pressure in getting rid of the inflowing water, and auxiliary plant was then brought into use. The damage will reach several thousands of pounds. An illustration of the wreckage appears in our "Notes."

A Corporation tramcar of the latest double-decker type was blown over at North Shore, Blackpool. Fortunately, there were no passengers aboard, and the driver and conductor escaped injury.

Hemel Hempstead.—ELECTRICITY ORDER.—The Electricity Commissioners have informed the Rural District Council that they had refused an Order to the Watford Corporation to supply electricity to the parish of Great Gaddesden, and have granted an Order to the Chesham Electric Light and Power Co., Ltd., subject to the maximum charge for electricity being reduced from 1s. to 9d. per kWh.

Ilford.—LOANS.—The Corporation Electricity Committee is applying for sanction to loans of £5,000 for domestic apparatus and £2,000 for hire installations.

London.—HACKNEY.—*Correction.*—In our last issue we stated that the Electricity Committee had recommended the borrowing of £24,275 in connection with a bulk supply *from* Stoke Newington. It is, of course, Stoke Newington which is to take a bulk supply from Hackney.

Middlesbrough.—ELECTRICITY SUPPLY.—The Rural District Council has approved the Cleveland and Durham County Electric Power Co.'s scheme to supply a large rural area in Cleveland. Sir William Fawcett states that the company has agreed to carry out the work on similar lines to those arranged by the original promoters, who have agreed to withdraw. The mains will be underground, and it is expected to have the work completed by October next. The price will probably be between 6d. and 7d. per kWh with a considerable reduction for supplies to farms.

Palestine.—ELECTRICAL DEVELOPMENT.—Work has been commenced on the Jordan-Yamuk section of the project for harnessing the Jordan River. The work forms a section of the scheme for which a £2,000,000 concession has been granted by the Palestine High Commissioner to the Palestine Electric Corporation. The scheme provides for the utilisation of the falls of the River Jordan between Lake Tiberias and Jis-el-myamijeh, where in a distance of about eight miles the fall is 130 ft. The Palestine Government is expected to be the principal consumer, as it is intended eventually to electrify the railways of the country. The Jaffa, Haifa, and Tiberias sections of the project are already completed.

Rugby.—HIRE-PURCHASE SCHEME.—The Urban District Council has adopted a scheme for the supply of domestic apparatus to be let out on the hire-purchase system.

South Africa.—EAST LONDON.—According to the *South African Power Engineer*, the city electrical engineer (Mr. J. Mordy Lambe), has recently reported to the Council on the position of the electricity undertaking. He estimates that the maximum load on the station will, in 1929, be practically equal to the total capacity of the generating plant at present installed and available for full use. The question of the provision of additional plant must, therefore, be considered. The extensions, additions and replacements will take at least two and a half years to complete, and the total amount recommended to be expended upon this work is £77,293. The necessity for accelerating the work of changing over from 110 V to 220-380 V and constructing a new distribution system is stressed in the report, particularly as the parts of the old system which remain are mostly in a very bad state, and until the new system is completed, domestic uses of electricity cannot be fully and properly developed. The amount required to complete this work is £42,584. For new consumers' connections £3,000 is required, while increased transformer capacity calls for the expenditure of £1,500. The total expenditure recommended is £124,790. Capital charges on the loan money will be £6,613, but the growth of the load is estimated to result in an increase of £19,047 in the revenue, while the works cost will be £7,570. The net result is a margin of £4,864, and on this basis the acceptance of the recommendations is urged.

South-East Lancashire Electricity Advisory Board.—SPECIAL ORDER.—The Board has decided to support the application of Manchester Corporation for a Special Order for the supply of electricity in the parishes of Northenden, Northern Etchells, and part of the parish of Baguley.

TRANSMISSION LINE.—The Board has been recommended by the Engineering Advisory Committee to approve the establishment of a 33,000-V transmission line between Barton (Manchester) and Stretford.

POWER STATION EXTENSIONS.—The Committee has been notified that the Electricity Commissioners have sanctioned the installation of one 3,750-kW, two-phase, 80-cycle turbo-alternator, and one 40,000-lb. boiler at Altrincham power station, and one 10,000-kW turbo-alternator with two 60,000-lb. boilers and accessories at Bury power station.

NEW PLANT AT SALFORD.—The Committee has recommended the Board to approve extensions at the Agecroft generating station of Salford Corporation, at an estimated cost of £150,000. The extensions provide for the installation of one 20,000-kW turbo-alternator with condensing and auxiliary plant (£78,000); one 22,500-kA, 6,600-33,000-V step-up transformer with 33,000-V switchgear and connecting cables (£17,000); two 65,000-lb. water-tube boilers complete with auxiliaries £50,000); and steam and water piping, feed pump, feed heater, &c. (£5,000). The proposed additions would increase the capacity of the station to 57,500 kW.

Spalding.—INAUGURATION OF SUPPLY.—After work extending over five months, the scheme for supplying electricity to the town has been completed, at a cost of £33,000, by the laying of 17 miles of 11,000-V cable from Eye Green, near Peterborough. Over 50 residents are using electricity for lighting and power purposes. It is hoped to link up the neighbouring villages with overhead cables shortly.

Special Orders.—Applications have been made to the Electricity Commissioners for Special Orders by Manchester Corporation authorising it to supply electricity in part of the rural district of Bucklow, and the Leicestershire and Warwickshire Electric Power Co., to supply in certain parishes in the rural districts of Billesdon, Blaby, and Market Harborough.

The Commissioners have submitted to the Minister of Transport for confirmation Special Orders made by them authorising the Cumberland Waste Heat Owners Co., Ltd., to supply electricity in part of the rural district of Whitehaven; the Wigan Corporation to supply in the rural districts of Billinge-and-Winstanley, and Orrell; the Electric Supply Corporation, Ltd., to supply in parts of the rural districts of Cuckfield and Chailey; and Harrogate Corporation in part of the rural district of Knaresborough.

Stirling.—ELECTRICITY AGREEMENT.—Negotiations between the Town Council and the War Department for a supply of electricity for lighting and cooking purposes at Stirling Castle have been completed, and the work of laying the main is now proceeding. Under the agreement electricity will be supplied to the castle, the military hospital, married quarters, and the military store at the Esplanade.

Northern Ireland.—PORTRUSH (CO. ANTRIM).—The Urban District Council has given instructions for the preparation of a modified extension scheme at the electricity works, the Electricity Commissioners having decided that a proposal to borrow £5,000 was too ambitious for present requirements.

Stafford.—OPPOSITION WITHDRAWN.—The Rural District Council has decided to withdraw its opposition to the application of the Power Development Co. for a Special Order to supply electricity in the Council's area, and also in the urban district of Rugeley. The proposed charges for lighting are 10d. per kWh, with minimum quarterly payments of 12s. 6d., for the winter, and 8s. 4d. for the summer. For other purposes the charge will be 4d. per kWh.

Stoke-on-Trent.—"ALL-ELECTRIC" HOUSES.—The Corporation Housing Committee has deferred the erection of further all-electric houses until the results for the winter quarter are available from the experimental houses.

Torquay.—EXTENSION OF SUPPLY.—The Corporation is to make application to the Electricity Commissioners for an Order authorising it to supply electricity to certain parishes in the rural districts of Newton Abbot and Totnes, and in the urban districts of Ashburton and Buckfastleigh. The borough electrical engineer (Mr. H. E. G. Woods) estimates that an overhead line from the existing sub-station at Ipplepen, *via* Broadhempston to Ashburton and Buckfastleigh, would cost approximately £6,000, but as it is proposed in future to supply the borough of Totnes in bulk from the same line branching through Broadhempston, Staverton, Dartington and Littlehempston, not more than two-thirds (£4,000) of the sum named will be charged to the extended area. The total estimated cost of the scheme, with sub-station, switchgear, &c., is £7,150.

Truro.—INAUGURATION OF SUPPLY.—An electricity supply for the town was formally inaugurated on October 19th. The supply is provided by the Truro Electricity Supply Co., and is carried by the company's overhead main from Carnon Valley, a distance of four miles. The initial pressure is 10,000 V, but the line is capable of carrying 33,000 V. The overhead line terminates at the city boundary, and from there is laid underground to a sub-station in the town, where space has been provided for additional transformers when required.

Western Australia.—YEAR'S WORKING.—The report on the Government electricity supply undertaking (engineer: Mr. W. H. Taylor) for the year ended June 30th last records a total income of £221,769, as compared with £202,037 in the preceding year. Working expenses amounted to £171,964, as against £147,620, leaving a gross profit of £49,805 (£54,417). After meeting interest charges, there was a net surplus of £7,465, as compared with £12,877 in 1925-26. The sales of electrical energy increased from 49,974,049 to 54,362,141 kWh, and the maximum load from 13,500 to 15,800 kW. The average price obtained per kWh increased from 0.96d. to 0.97d. Considerable progress was made during the year with extensions to the power station, which will include one 12,500-kW turbo-alternator, condensing and boiler-house plant. The revised estimate of these extensions is £248,959.

Whitehaven.—LOAN.—The Rural District Council has applied for sanction to a loan of £1,150 for wiring houses under the assisted scheme.

Tramway and Railway Notes.

Continental.—POLAND.—According to *Commerce Reports*, a Polish joint-stock company will be shortly formed to construct an electric railway from Tomaszow to Lodz. It is expected that work on the new line will begin during April, 1928, and will be completed within three years.

Irish Free State.—DUBLIN-LUCAN TRAMWAY.—The work of laying the new tramway from Dublin to Lucan is now in progress. The new rails are being laid down on sleepers. On the outskirts of the city workers are cutting a way for the electric cable, which at Parkgate Street will be taken overhead. Meanwhile the old overhead wires are being used for the electric lighting of the village of Lucan. It is expected that the work will be completed by the end of the year.

Liverpool.—YEAR'S WORKING.—At a recent meeting of the Corporation Tramways Committee, the chairman stated that during the last 12 months the number of tramway passengers carried was 260,365,752 (an increase of 16,155,625), which constituted a record. The receipts were £1,445,442, an increase of £80,905. New tramway routes inaugurated during the past year totalled 9¾ miles. The mileage run by the tramcars was 18,837,431.

LOANS.—Application is to be made by the Committee for sanction to the borrowing of the following sums:—(*a*) Edge Lane tramway works and car shed (to complete), £257,960; (*b*) Smithdown Road car shed extension (to complete), £51,000; (*c*) purchase of motor-omnibuses, £90,000.

Middlesex.—NEW TRAMWAYS.—Application is being made to the Ministry of Transport for an Order to authorise the construction of tramways by the Middlesex County Council to connect the Metropolitan Electric Tramways at High Road, Tottenham, with the Walthamstow tramways at the bridge over the River Lea, *via* Broad Lane and Ferry Lane, Tottenham.

Western Australia.—YEAR'S WORKING.—The report of the general manager of the Government tramway undertaking (Mr. W. H. Taylor) for the year ended June 30th last shows a total revenue of £294,068, as compared with £286,707 in the previous year. Operating expenses amounted to £241,280, as against £240,953, leaving a gross profit of £52,788 (£45,754). After payment of interest, there was a net profit of £6,552, as compared with £599 in the preceding year. The capital expenditure during the year amounted to £33,211, the bulk of which was spent on extensions to the system. The number of passengers carried increased from 29,599,785 to 30,541,079, but the car miles run decreased from 3,010,253 to 2,995,769. The revenue per car-mile increased from 22.86d. to 23.56d.

Telegraph and Telephone Notes.

Australia.—CABLE TELEGRAPHY.—Statistics of cable traffic for the year ended June last show, says the *Daily Telegraph*, that the number of words carried in both directions reached the total of 27,670,000, of which the Pacific Cable Board handled 11,960,000 and the Eastern Telegraph Co. 15,710,000 words. Of the international traffic originating and terminating in Australia, the United Kingdom was responsible for 12,000,000 words, the United States for 2,700,000, and other countries for 4,800,000. The figures for New Zealand and the Pacific Islands were 5,900,000, and for messages in transit, mainly from New Zealand through the Eastern Company, 2,300,000. A feature is the fact that the international cable traffic was actually higher than in the previous year, despite three months of "beam" competition. According to the present traffic returns, the "beam" system is carrying about 60 per cent. of the total United Kingdom business, the proportion being less for full-rate messages and higher for the cheaper classes of traffic. The Commonwealth terminal charges amounted to £217,000 last year.

Earthquake.—TELEGRAPH CABLE DAMAGED.—The centre of the earthquake recorded on seismographs on October 24th was, apparently, in the Pacific Ocean, but Alaska suffered a shaking. A telegraph submarine cable was broken in two places—near Wrangell, 50 miles from Petersburg, and between Juneau and Skagway.

Storm Damage.—OVERHEAD LINES SUFFER.—During the gale which swept the British Isles during the night of October 28th-29th, much damage was caused to overhead telephone and telegraph lines in all localities of the country. A line between London and Lincolnshire that operates in conjunction with the "beam" radio-telegraph service to India and Australia suffered, as did also one of the relay lines of the Daventry broadcasting station, causing the station to close down; the main aerial of the Liverpool broadcasting station was blown down.

The Telephone Service.—ANGLO-SWISS SERVICE.—The Postmaster-General announces that a service is now available between all the principal provincial towns in this country (as well as London) and all the principal towns in Switzerland. A booklet just issued by the Post Office gives full information about the charges and facilities available for the Anglo-Continental and Transatlantic telephone services. Leaves can be inserted whenever a new service is added.

United States.—RADIO-TELEGRAPHY.—The Mackay system, which includes the Postal Telegraph-Commercial Cable Companies, following the decision of the United States Circuit Court of Appeals on October 6th, that Dr. Lee De Forest was the original inventor of the radio feed-back circuit and oscillating audion, is to establish short-wave wireless systems across the Pacific Ocean and throughout the United States in about six months; the starting of the land system only awaits the approval of the Federal Radio Commission. The Court of Appeal's decision and the contract held with Federal Telegraph Co., of California, are accepted by the Mackay Companies as placing them in a position to begin wireless operation without fear of litigation. They will begin the installation of short-wave wireless stations across the Pacific Ocean that will at nominal expense, says *T. and T. Age*, double the capacity of the service to the Orient now provided by cable connecting San Francisco, Honolulu, Midway Islands, Guam, Manila, and Shanghai. Radio stations will be erected at all those places and will provide service to Manila by automatic relay; if static interferes with communication between stations in the chain, messages will be relayed by cable. The wireless system will be used to carry deferred, or cheaper, messages, and to supplement the cable at times of heavy traffic.

Radio Notes.

Australia.—ROYAL COMMISSION'S REPORT.—According to *World Radio*, the Commission has recommended, *inter alia*, that the control of broadcasting remain in the hands of the Postmaster-General as at present, subject to administration by a committee comprising the Director of Postal Services as chairman, an officer of the Wireless Services (presumably a Government servant) and a "Broadcasting Officer" (presumably appointed from one of the broadcasting stations). Re-allocation of wave-lengths between the present bands and the location of all existing stations to be reviewed, B-class stations (which receive no revenue from the licence fees) to be limited in power; that no fee be charged for the licence of a blind person; that definite wave-bands be allotted to amateurs; that radio traders be compelled to keep a register of the names of all persons who purchase complete receiving sets, to be available for inspection by radio inspectors; that the charges for performing rights on copyright music be reduced to 4d. per item (instead of about 1s. 10d.), or 5 per cent. of the gross revenue of the station, no limit being placed upon the number of items broadcast; and that the patent rights charged by Amalgamated Wireless (Australasia), Ltd. (holder of Marconi patents), be reduced from 5s. per listener's licence to 2s. (this charge is collected from the broadcasting stations at present).

That in States where there are more than one A-class station steps should be taken to ensure that they will not broadcast news matter, including sporting news, simultaneously; A-class stations are also recommended to provide announcers who are proficient in the correct use and pronunciation of the English language. That stations be called upon to include advanced educational matter in their programmes. Further, that the Commonwealth Government re-acquire all land and coastal stations and that an Inter-Departmental Committee should co-ordinate various wireless services from the point of view of defence. The Commission finds that the public has little to complain of in the programmes broadcast; it recommends that the stations in sparsely-populated States like Tasmania and West Australia should receive a subsidy of £5,000 a year each from the revenue of the stations in the States like Victoria and New South Wales.

Empire Broadcasting.—AUSTRALIAN EXPERIMENT.—The third broadcast to the Empire from Australia on October 30th was much more successful than the second, a fortnight previously, which had to be abandoned owing to the bad atmospheric conditions. A special programme was transmitted by 2FC, the Sydney station, on a short wave-length, and was picked up at the B.B.C. listening post at Keston, and rebroadcast from 2LO, 5XX, and 5GB, whence it could be heard by listeners throughout the country. As the time, "Four o'clock, Monday morning, at Sydney" (October 31st) was being announced, clocks could be heard striking 6 p.m. (October 30th, Sunday) in England. Much of the programme was heard with ease.

FIRST B.B.C. ATTEMPT.—The B.B.C. announces that the first programme to be broadcast experimentally by it from England to the Empire will be the Armistice Day Remembrance Festival at the Royal Albert Hall. The transmission has been arranged to take place from 8 to 10 p.m., G.m.t., through 5XX for the British Isles and Europe, and through 5SW (the new experimental short-wave transmitter at Chelmsford) for the Dominions and Colonies overseas, which will work on 24 metres with a power of 20 kW. Attempts will be made to relay this programme throughout the broadcasting systems of the Dominions, using 5SW in its legitimate function of inter-Continental link.

India.—NEW TRANSMITTER.—A 250-watt transmitting plant is being erected by the Burma Radio Syndicate, states *Indian Engineering*, and the Syndicate hopes to commence broadcasting shortly.

New Zealand.—CHURCH STATION.—The Church of England authorities in Auckland, alive to the possibilities of broadcasting as a means of disseminating religious teaching, says the *Daily Mail*, are to establish a station of their own at a heavy cost.

Porto Rico.—NEW RADIO SERVICE.—A new direct radio service between the United States and Porto Rico was opened on October 10th by the Radio Corporation of America. The transmitting apparatus at San Juan, P.R., is of the modern short-wave vacuum-valve type, says the *T. & T. Age*, with an average power of 20 kilowatts.

Radio Conference.—IMPORTANT PROPOSALS.—The technical sub-committee of the International Radio and Telegraph Conference meeting in the U.S.A. voted by 10 to 7 to exclude broadcasting from a band between 1,050 and 1,550 metres. Germany, France, Norway, Sweden, Austria, Czecho-Slovakia, and the Netherlands strongly opposed the motion, and a subsequent message announced that the Sub-Committee had reached a compromise whereby all European nations will be permitted for one year to broadcast on wave-lengths between 1,550 and 1,340 metres. The Sub-Committee also adopted an agreement that, notwithstanding the adoption of wave-length band restriction, certain services of each nation shall be privileged to use any wave-length for any purpose, so long as such use does not interfere with another service authorised by the allocation agreed upon.

According to the *Daily Telegraph*, it adopted an agreement allocating adopted wave-lengths applicable in the future, but does not propose prohibiting or abolishing existing stations. Each nation is to conform to the new allocations as soon as practicable. Great Britain, desiring to keep her bands free for aviation services, voted with the United States, but favoured reservations for European broadcasting on a 1,550- to 1,875-metre band. The delegates of the principal nations at the Conference have agreed to frame the proposed Radio Convention in two sections, one to be signed by nations like the United States, with private communication systems, and the other by nations with Governmental communications. Thus the United States private wireless companies escape international regulation, a point upon which there has been controversy since the Conference opened. The general regulations to which the United States adhere include rules for preventing interference, allocating frequencies, and promoting uniformity in mobile services, both for ships and aircraft.

What is described at Washington as an American victory was the recommendation of the Mobile Service Sub-Committee of the Conference that spark radio sets be eliminated from use in ships by 1940. Mr. White, an American delegate, discussing the number of votes to be allowed to each country, advocated one vote for each independent governing nation. This proposal, it was stated, would include the Irish Free State, Canada, Australia, New Zealand, and probably South Africa among the independent nations, but would exclude British India and the Philippines. The proposal, if ratified, would eliminate the suggestion of a British delegate that the vote be "by administration," which it was estimated would give no fewer than 60 votes to the British Empire. Another proposal by a Chinese delegate was that the vote be according to the volume of traffic, but that was opposed by the Americans on the ground that its enforcement would involve too much technical research.—*Reuter* (Washington).

Spain.—TWO STATIONS CLOSE DOWN.—The Government has annulled by Royal Order the concessions granted to the Radio Iberica Company and Vicente Goyeneche, the owner of "Radio Madrileña," on October 31st, 1924, and July 22nd, 1925, respectively, for broadcasting purposes, on the ground that neither station has broadcast a regular programme since April last, and they have failed, therefore, to comply with the concession. The stations were EAJ6 and EAJ12, and broadcast on 272- and 297-metre wave-lengths, says *World Radio*. Thus Madrid is left with only "Union Radio," EAJ7, on 375 metres, and "Radio España" on 400 metres. Radio Iberica will be remembered as the first Spanish broadcasting station.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Ardsley (Yorks.).—November 5th. West Riding Education Committee. Electric lighting installation at East Ardsley Council School. Mr. P. Beaumont, Education Offices, 8, St. John's North, Wakefield.

Argentina.—BUENOS AIRES.—January 17th. National Sanitation Works Department. Three 350-kW Pelton-type turbines and 6,600-V, three-phase generators. Two 20-kVA 3-phase static transformers, one distribution switchboard and connections, &c. (B.X. 3921.)*

Australia.—SYDNEY.—December 7th. N.S.W. Government Railways. Three 5-ton and one 25-ton electric travelling cranes.

MELBOURNE.—January 3rd. Postmaster-General's Department. Switchboard lamps, lamp caps, and lamp sockets. (B.X. 3943.)*

Bingley.—November 18th. West Riding County Council Public Health and Housing Committee. Electric lighting installation, Eldwick Sanatorium. Specifications, &c., from West Riding architect, County Hall, Wakefield.

Bradford. — November 12th. Tramways Committee. Stores, including electrical fittings for tramcars, insulating material, &c., for 12 months. Mr. R. H. Wilkinson, general manager, 7, Hall Ings, Bradford.

Dinas Powis.—November 16th. St. Andrews Parish Council. Wiring the Parish Hall for electricity. Specifications from Mr. T. W. Davies, clerk to the Council, Council Office, Dinas Powis.

Dublin.—November 8th. Dublin United Tramways Co. (1896), Ltd. Stores, including cables, car fittings, electric lamps, &c., required during year ending December 31st, 1928. Form of tender from Mr. G. M. Harriss, general manager, 59, Upper Sackville Street, Dublin.

Edinburgh.—November 19th. Tramways Department. 25 air brakes suitable for electric tramcars. Specifications from Tramways Manager.

Egypt.—CAIRO.—November 26th. Ministry of the Interior. One 128-kW Diesel engine-driven electrical installation for the town of Simbellawem. (B.X. 3885.)*

Glasgow.—November 7th. Corporation. Electric lighting installation for the Parkhead rehousing scheme. Specifications from Mr. R. B. Mitchell, engineer, 75, Waterloo Street, Glasgow.

Great Yarmouth.—November 19th. Electricity Department. 30,000 yd. 33,000-V 3-core cable, 15,000 yd. pilot and telephone cable, and 7,040 yd. 11,000-V, 3-core cable. (October 28th.)

Hastings.—December 5th. Electricity Department. One turbo-alternator and one water-tube boiler. (See this issue.)

Hawarden.—November 11th. Electricity Department. Switchgear for sub-station. (October 28th.)

Hull.—December 7th. Electricity Committee. Boiler house steel structure, h.p. water-tube boilers, coal- and ash-handling plant. (See this issue.)

India.—November 18th. India Store Department. 26,600 inert cells, S., &c. (See this issue.)

London.—November 22nd. North British Aluminium Co., Ltd. Water turbines, alternators and exciters for the Lochaber water power scheme. (October 28th.)

SOUTHWARK.—November 24th. Board of Guardians. Complete wireless installation for the Southwark Hospital, East Dulwich Grove. (October 28th.)

H.M. COMMISSIONERS OF WORKS.—November 14th. Supply of (1) Electrical, (2) mechanical engineering labour-in-day-work in connection with the maintenance, &c., of installations in the Glasgow district during the period of three years from January 1st, 1928. Forms from Contracts Branch, H.M. Office of Works, London, S.W.1.

Manchester.—November 28th. Electricity Committee. H.p. steam and feed water pipework. (See this issue.)

New Zealand.—WELLINGTON.—January 10th, 1928. Public Works Department. Additional 110,000-V switchgear, steelwork and control board for Arapuni electric power supply. (B.X. 3837.)*

January 17th. 110,000-V switchgear, protective apparatus, steelwork, storage batteries, &c., for the Waikaremoana power scheme. (B.X. 3858.)*

December 13th. Three 10-ton overhead travelling double-girder cranes. (A.X. 5378.)*

December 13th. 50-V lightning arrestors for the Arapuni power scheme. (B.X. 3919.)*

January 17th. 50-kV switchgear and steelwork for Arapuni. (B.X. 3917.)* 11,000-V switchgear and metering equipment for Arapuni (Sec. 254). (B.X. 3920.)*

January 24th. 11,000-V switchgear and metering equipment for Arapuni (Sec. 261). (B.X. 3918.)*

Pontefract.—November 26th. Installation of electric lighting at public baths and destructor. Specifications from Mr. W. H. Newton, borough engineer, Municipal Offices, Pontefract.

Rochford.—November 12th. Board of Guardians. Additions to the electrical storage battery at the Institution. (See this issue.)

South Africa.—TULBAGH.—December 12th. Municipal Council. Erection of power station and distribution network. (B.X. 3911.)*

DURBAN.—November 7th. Corporation. One 500-kVA 6,600/11,000-V transformer. (October 28th.)

JOHANNESBURG.—November 17th. Municipal Council. Supply of h.p. cable. (B.X. 3931.)*

Stockport.—November 11th. Electricity Department. One water-tube boiler with all accessories. (October 7th.)

Stockton-on-Tees.—November 11th. Electricity Department. Paper-insulated cables, a.c. meters, and house-service cut-outs for 12 months. (October 28th.)

West Ham.—November 10th. Board of Guardians. One electric roasting oven, hot cupboard, and fish fryer. (October 28th.)

Alterations and additions to the electric lighting and power mains at the Central Home, Union Road. (See this issue.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Australia.—MELBOURNE.—Electric Supply Committee.

Electricity meters.—Edison Swan Electric Co., Ltd. (£94); Landis & Gyr, Ltd. (£724).

350 d.c. two-wire meter interiors (£849).—W. G. Watson and Co., Ltd.

State Electricity Commission of Victoria.

Switchgear and accessories (£4,030). — Metropolitan-Vickers Electrical Co., Ltd.

SYDNEY.—N.S.W. Railways and Tramways.

6¼ miles 50-pair telephone cable (£4,081).—Enfield Cable Works (Aust.), Ltd.

Gear and pinions for electric railway motor equipment (£6,510).—Australian General Electric Co., Ltd.

Two 3-ton electric goods lifts (£3,160).—Standard-Waygood, Ltd. —*Tenders.*

Barking Town.—Housing Committee. Recommended:—

Electric light installation for the Gascoigne Road flats:—

F. W. Jameson. (Recommmended.)	**£192**
W. H. Sugden & Co., Ltd.	249
E. O. Porter	275

Birkenhead.—Electricity Committee. Accepted:—

Two h.p. switchgear cubicles (£200).—English Electric Co., Ltd.

6,500 yd. a.c. distributing cable (£2,224); 2 miles twin v.i.r. cable (£540).—Macintosh Cable Co., Ltd.

2,200 yd. e.h.p. cable (£684).—British Insulated Cables, Ltd.

Blackpool.—

Electrical installation at the new Williams Deacons's bank, Upper Talbot Street.—R. Derbyshire, Ltd.

Electrical installation at the Gordon Memorial Baptist Church.—Jones Bros. (Blackpool).

Bradford.—Accepted:—

Electric lighting installation, on the "Holoplane" system, Church of St. Philip and St. James, Scholes.—F. W. Birkett & Sons, Ltd.

Brighton.—Electricity Committee. Accepted:—

Work in connection with oil coolers at Southwick power station.—Staveley Coal & Iron Co., Ltd. (£82); W. H. Allen, Sons & Co., Ltd. (£432).

L.p. switchgear at North Road sub-station (£2,735).—Metropolitan-Vickers Electrical Co., Ltd.

Carlisle.—Housing Committee. Accepted:—

Wiring 334 houses on three housing estates for electricity.—William Batey & Sons.

Dunblane.—

Electrical installation at new hall.—Lockhart & McNab.

Dundee.—Electricity Committee. Accepted:—

3,500 yd. (approx.) cable of German manufacture (£241).—Power & Lighting Cables, Ltd. The lowest British offer was £329.

Glasgow.—CORRECTION.—By a printer's error, four tenders recommended for acceptance by the Tramways and Libraries Committees were placed under "Islington" in our last issue (p. 735).

Hull.—Town Council. Accepted:—

W. F. Dennis & Co., 4,000 telephone insulators, £90.
Ericsson Telephones, Ltd., switchboards, £152.
British Insulated Cables, insulator bolts, £64.

Ilford.—Electricity Committee. Recommended:—

One mile triple-concentric cable (£1,806).—Union Cable Co., Ltd.

One mile ditto (£987).—Greenwich Cable Works, Ltd.

Tramways Committee. Accepted:—

Two miles of copper wire, 9 7/16d. per lb.—R. Johnson and Nephew, Ltd.

150 tons tram rails £10 18s. a ton, 200 pairs fishplates £14 13s. per ton.—Cargo Fleet Iron Co., Ltd.

Liverpool.—Tramways, Electric Power and Lighting Committee. Recommended:—

6,000-volt armourclad circuit breaker and transformers for Aintree sub-station (£727).—A. Reyrolle & Co., Ltd.

One "Attritor" for fuel pulverising plant, with set of spare parts, &c., for Lister Drive (£1,139).—A. Herbert, Ltd.; motor for ditto, Crompton-Parkinson, Ltd.

Steel rail junctions.—Edgar Allen & Co., Ltd. (£2,657); Hadfields, Ltd., £2,758.

Six 500-kVA, 3-phase, oil-cooled transformers (£1,865).—Metropolitan-Vickers Electrical Co., Ltd.

Six ditto (£1,865).—English Electric Co., Ltd.

London.—AIR MINISTRY.

Electric lamps.—Edison Swan Electric Co., Ltd.

SOUTHWARK.—Electricity Committee. Accepted:—

Battery plates (£180).—Alton Battery Co., Ltd.

LONDON COUNTY COUNCIL. Accepted:—

V.i.r. cables.—British Driver-Harris Co., Ltd.

Manchester.—Electricity Committee. Accepted:—

Four 250-kVA static transformers.—Hackbridge Electric Construction Co., Ltd.

Annual contracts:—

Electric cookers.—Cable Accessories Co., Ltd.; Metro-Vick Supplies, Ltd.; and Jackson Electric Stove Co., Ltd.

Double-pole quick-break switches.—Santon, Ltd.; and Edison Swan Electric Co., Ltd.

Education Committee. Accepted:—

Electric lighting installation at Victoria Avenue Municipal school.—G. Brader; Newton Heath clinic.—R. Seddon and Sons; Barlow Moor Road Municipal school (infants).—J. A. Somerset & Co.

Alterations to electric lighting installation at School of Art.—Power Contracts, Ltd.

Nantwich.—Urban District Council. Accepted:—

Electrical recorder and fittings for the water supply scheme (£302).—J. Blakeborough & Sons, Ltd.

Oldham.—Electricity Committee. Accepted:—

Switchboard.—Ferguson, Pailin, Ltd.
Conduit.—Doulton & Co., Ltd.
Transformers.—Ferranti, Ltd.
A.c. motors.—English Electric Co., Ltd.; and British Thomson-Houston Co., Ltd.
Motor-generator.—Crypto Electrical Co., Ltd.
Water-cooling towers for new power station.—Premier Cooler & Engineering Co., Ltd.

Salop.—County Education Committee. Accepted:—

Installing electric light at Weston Rhyn schools.—G. H. Smallwood & Co.

Tynemouth.—Electricity Committee. Accepted:—

Switchgear (£1,019).—A. Reyrolle & Co., Ltd.

Wick.—Borough Council.

Oil-engine generating plant, booster, switchboard and battery, underground and overhead mains and street lighting.—T. Laurie & Co., Ltd.

Forthcoming Events.

Institution of Mechanical Engineers.—Friday, November 4th. Storey's Gate, S.W. 6 p.m. Thomas Hawksley lecture, "Application of X-Rays to the Study of the Crystalline Structure of Materials." Sir W. H. Bragg, F.R.S.

Junior Institution of Engineers.—Friday, November 4th. 39, Victoria Street, S.W. 7.30 p.m. "Engineering Salesmanship." Mr. R. Lowe.

Friday, November 11th.—7.30 p.m. Annual general meeting.

Association of Mining Electrical Engineers (South Wales Branch).—Saturday, November 5th. South Wales Institute of Engineers, Cardiff. 6 p.m. "Rubber and its Application to Engineering in Mining." Dr. J. R. Scott and Mr. E. B. Johnson.

Salford Technical and Engineering Association.—Saturday, November 5th. Royal Technical College. 7 p.m. "Questions for Open Discussion."

Society of Engineers.—Monday, November 7th. Burlington House, W. 6 p.m. "Economic Transport." Mr. H. W. Towse.

Institution of Electrical Engineers.—INFORMAL MEETING.—Monday, November 7th. London, W.C. 7 p.m. "Recent Developments in Electro-medical Appliances." Mr. C. H. Holbeach.

(London Students' Section).—Friday, November 4th. Institution, London, W.C. 6.15 p.m. "From the Grid to the Consumer." Captain J. M. Donaldson.

(Mersey and North Wales (Liverpool) Centre).—Monday, November 7th. University, Liverpool. 7 p.m. "The Applications of Electricity in Warships." Mr. W. McClelland.

(Scottish Centre).—Tuesday, November 8th. Royal Technical College, Glasgow. 7.30 p.m. "The Applications of Electricity in Warships." Mr. W. McClelland.

(Scottish Students' Section).—Wednesday, November 9th. Royal Technical College, Glasgow. 7.30 p.m. "A.c. Metering Equipment." Mr. R. J. Rennie.

(Dundee Sub-Centre).—Thursday, November 10th. University College, Dundee. 7.30 p.m. "Electrical Repairs to Motors and Dynamos." Mr. A. S. M'Whirter.

(South-Midland Centre).—Wednesday, November 9th. University, Birmingham. 7 p.m. "Economic Aspects of Pulverised Fuel," Mr. F. Forrest. "Present and Future Possibilities of Extracting Oil from Coal," Prof. A. W. Nash. "Coal Analysis in Relation to Heat Value for Steam Raising," Prof. K. N. Moss.

(North-Western Students' Section). — Tuesday, November 8th. Milton Hall, Manchester. 7 p.m. "Modern Practice with Car Starter and Wireless Batteries, their Troubles and Care." Mr. R. Winnard.

Illumination Design Course.—Monday, November 7th. Lighting Service Bureau, 15, Savoy Street, W.C. 7.30 p.m. "The Principles of Floodlighting."

Institution of Engineers and Shipbuilders in Scotland.—Tuesday, November 8th. Rankine Hall, Glasgow. 7.30 p.m. Ordinary meeting.

Institute of Wireless Technology.—Tuesday, November 8th. Engineers' Club, London, W.C. 7 p.m. "A Note on the Performance of Valve Detectors." Messrs. W. B. Medlam and U. A. Oschwald.

Royal Institution of Great Britain.—Tuesday, November 8th. Albemarle Street, W. 5.15 p.m. "Light and Sight." Sir J. H. Parsons.

Association of Supervising Electrical Engineers.—Wednesday, November 9th. Junior Institution of Engineers, 39, Victoria Street, S.W. "I.E.E. Wiring Regulations" (9th Edition). Mr. A. Kirk.

Institute of Metals (London Local Section).—Thursday, November 10th. Royal School of Mines, South Kensington, S.W. "Some Metallurgical Problems of the Electrical Industry." Mr. C. C. Paterson.

(Swansea Local Section).—Wednesday, November 9th. Thomas' Café, High Street, Swansea. 7 p.m. "Pyrometers in Works Practice." Mr. P. Macnair.

Physical Society.—Friday, November 11th. Imperial College of Science, South Kensington, S.W. 5 p.m. Ordinary scientific meeting.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following:—

MARIE cooker No. 63.

Notes.

E.A.W. Activities.

On October 20th fifty members of the Electrical Association for Women visited the works of Messrs. J. H. Tucker & Co., Ltd. Time only permitted a cursory examination of the numerous operations involved, and the party went away very much impressed and considerably wiser in the matter of what the manufacture of switches and accessories entailed. At the conclusion of the tour, tea was served in the canteen, and Lady Brookes proposed a vote of thanks to the directors of Messrs. Tucker & Co.

On October 27th members of the South Wales and Monmouthshire branch of the Association made a tour of inspection of the pickle and jam works at Ely, Cardiff, of Messrs. S. Chivers & Co., Ltd.

Manchester Electro-Harmonic Society.

This Society opened its ninth season on Friday, October 21st, with an excellent concert held at the "Manchester Limited" Restaurant, Royal Exchange, in Cross Street, Manchester. Mr. J. A. Robertson, the president, was in the chair (he has, by the way, accepted the presidency for the fourth year in succession), and there was a large attendance of members. The activities of the Music Committee which was instituted last year have apparently given every satisfaction, judging from the fact that the membership is increasing. The Society has arranged to have an interchange of visits with the Liverpool Electro-Harmonic Society, and another addition to the programme this season will be a Ladies' Evening. The Manchester Society extends a hearty invitation to any member of the electrical or allied trades to attend its concerts when visiting Manchester. The dates fixed are:—November 18th, December 16th, January 20th, 1928, February 17th, and March 16th. Particulars regarding all arrangements can be obtained from the Hon. Secretary, Mr. C. E. Leak, 196, Deansgate, Manchester.

Appointments Vacant.

Assistant electrical engineer (£480), for the Government of the Gold Coast: telephone inspector (£350), for the Post Office Department of the Government of British Guiana; switchboard attendant, for the Bermondsey Council's Electricity Department. (See our advertisement pages to-day.)

Faraday House Electrical Engineering College.

Although the front of this building suffered considerable damage owing to the fall of a lofty crane in Southampton Row last Friday night, it has been found possible to carry on the work of the college. The testing laboratories received but little damage, and the work of the Standardising Department is proceeding normally.

The B.E.A.M.A. Dinner.

The annual dinner of the British Electrical and Allied Manufacturers' Association (Inc.) will take place at the Connaught Rooms on Thursday, November 17th. Lord Derby, the President of the Association, will be in the chair, and the speakers will include Lord Weir, Lord Gainford, and Sir Andrew Duncan.

Standardisation of Electrical Material in the United States.

The announcement is made by the American Engineering Standards Committee that a sectional committee is to be appointed for the preparation of national specifications for mercury arc rectifiers. The work, which will include definitions, service conditions, load limitations, power factor, heating, short circuit limitations, dielectric tests, insulation resistance, voltage regulation, efficiency and rating, is to be undertaken as a result of requests by the American Railway Association and the American Institute of Electrical Engineers. The latter will serve as sponsor for the sectional committee.

Standard values for the electrical and related constants of hard-drawn aluminium conductors have recently been approved by the American Engineering Standards Committee for commercial use. The need for such a national standard had arisen from the extensive use of aluminium for transmission lines and other electrical purposes. The standard was drawn up by a sectional committee under the sponsorship of the American Institute of Electrical Engineers. The subject is one that has been considered by the International Electrotechnical Commission as a basis of international agreement along the lines of the well-known "copper standards." The American standard for the conductivity of aluminium is said to be appreciably higher than that used in some foreign countries.

The following matters have been referred by the American Engineering Standards Committee to its Electrical Advisory Committee for investigation and recommendations:—

(1) Rotating Machinery Standards.—A group of four standards of the American Institute of Electrical Engineers dealing with large power direct-current apparatus, large power motors and generators with fractional power motors, and five standards of the National Electrical Manufacturers' Association are being considered. The Advisory Committee has been requested to work out an administrative method of unifying these machinery standards.

(2) Safety Code for Electrical Power Control.—A careful study of the question of the need for a separate code with the scope as originally outlined has been made by the members of the former Electrical Safety Conference and the Electrical Advisory Committee. It has been agreed that it is preferable to abandon the idea of a separate code, and recommendations have now been prepared which will have the effect of distributing the fields intended for this code between the National Electrical Code, the National Electrical Safety Code, and the codes for which the Underwriters' Laboratories are responsible.

Greyhound Track Lighting.

At the recently-opened greyhound racing track at Carntyne, in the east end of Glasgow, a special feature has been made of the night illumination, both of the track and enclosure. Sufficient intensity has been provided in the latter to allow for the hazy atmosphere which so often afflicts the industrial

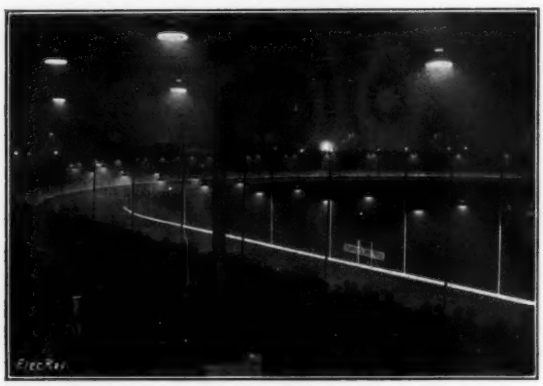


Fig. 1.—The Carntyne Greyhound Track at Night.

area, so that under anything less than dense fog the spectators can read their programmes and study their betting cards with ease. The track illumination, fig. 1, can only be characterised by the words "brilliancy without glare." Standard Benjamin reflectors are used throughout, and the

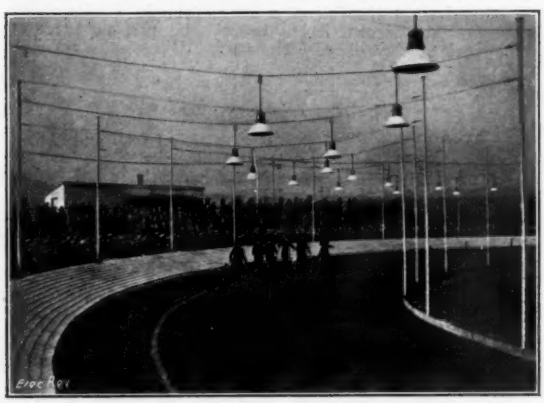


Fig. 2.—A Daytime View of the Track.

contractors have been highly complimented on the result. Some idea of the spacing of the fittings may be gathered from the daylight illustration, fig. 2.

The British Science Guild.

The third annual Norman Lockyer Lecture, on "Scientific Ethics," will be given by the Very Rev. Dean Inge, C.V.O., D.D., on Monday, November 21st, at 4 p.m., in the Goldsmiths' Hall, Foster Lane, London. The president of the British Science Guild, Sir Alfred Mond, Bart., M.P., will take the chair. Admission to the lecture is free, and tickets may be obtained on application to the Secretary, 6, John Street, Adelphi, London, W.C.2.

Association of Mining Electrical Engineers.

Mr. H. Cotton presided, on Saturday last, at Nottingham, at the opening of the autumn session of the Midland branch of the Association; among the guests was Mr. G. N. Harvey, president of the organisation, who referring to examinations, said that the results had been fair, but not altogether satisfying. They wanted more members to sit for the first-class certificates. A sub-committee had been devoting very serious consideration to the question whether the Association's certificate should be made compulsory for colliery electricians and the decision had been arrived at that the time was not yet ripe for pressing it forward. They had a considerable membership, but not yet could they claim as an Association sufficiently to represent the large body of mining electricians in this country. They were, however, ready at any time to go forward with the matter if approached by the Government as an Association.

The First Frequency Change-over.

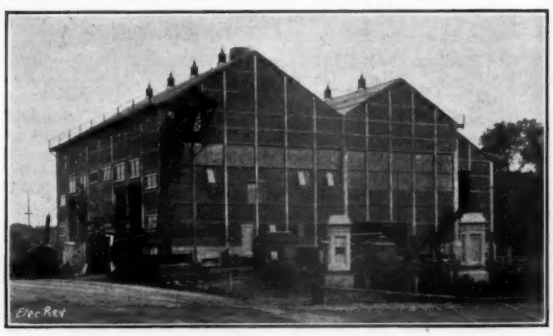
Glasgow Corporation Electricity Department and the English Electric Company have the honour of taking the first effective step towards the unification of supply frequency in this country, which is a basic principle of the national electricity schemes prepared by the Electricity Commissioners and promulgated by the Central Electricity Board. In the Central Scotland area several of the largest systems, amongst them Glasgow, generate at a frequency of 25 cycles per second. Mr. R. B. Mitchell, chief engineer and manager of the Glasgow Corporation undertaking, has lost no time in tackling the considerable problem presented by the change-over, and we understand that the English Electric Company has recently put in hand for the Dalmarnock power station a 50-cycle turbo-generator set, with an output of 25,000 kW. This set, which will be of the company's latest 2-cylinder type, will take the place of one of the existing 25-cycle machines, and in due course all the other sets in the station will be either converted or replaced.

A £20,000 Claim.

The *Sydney Evening News* for September 20th reported that Mr. Silas Young Maling, deputy-general manager of the Sydney City Council's Electricity Department, had caused a Supreme Court writ for £20,000 damages to be issued against S. Bennett, Ltd., and George H. Goddard, publisher of the *Sunday News*, for alleged libel published in that paper in an article "dealing with matters concerning the Town Hall."

New Colchester Power Station.

The accompanying illustration is an external view of the new power station at Colchester, which was inaugurated by the Mayor of that borough, Councillor C. C. Smallwood, on



The Colchester Power Station.

October 20th. One 1,560-kVA generating set is at present installed. This is the first of three similar sets; it is hoped to have the second set connected up in a few days' time, and the third in three or four weeks. Under the South-East England scheme of the Central Electricity Board, the station will eventually become a transforming centre for the surrounding towns of Clacton, Frinton and Walton.

Royal Air Force Commissions.

The Air Ministry announces that a considerable number of short-service commissions (for five years on the active list and four in the reserve) will be granted in December, and the Air Ministry is prepared to consider applications now from candidates between 18 and 25 who wish to fly, are well educated and of good eyesight and physique. Applications for forms and regulations should be made to the Secretary, Air Ministry, Kingsway, W.C.2.

Fatalities.

It is reported that four people died from suffocation in a room of a house in Legh Place, Ardwick, Manchester, on October 24th. At the inquest held on October 28th, Mr. A. L. Lunn, of the Manchester Corporation Electricity Department, stated that an electric cable fused and the heat melted the bituminous covering. By means of a culvert the fumes generated entered the cellar, passed through a cavity between the inner and outer walls, and into the bedroom. Mr. H. Heap, the city analyst, said that death was caused by poisoning with carbon monoxide produced by the burning of the cable. A gas main in the vicinity had been fractured and gas had leaked into the house, but in all probability this occurred after the fusing of the cable. In each case the coroner entered a verdict of death by misadventure.

Patrick Michael, aged 9, of Poplar, received a fatal electric shock on the Southern Railway, near Woolwich Dockyard, on October 31st.

Loughborough College.

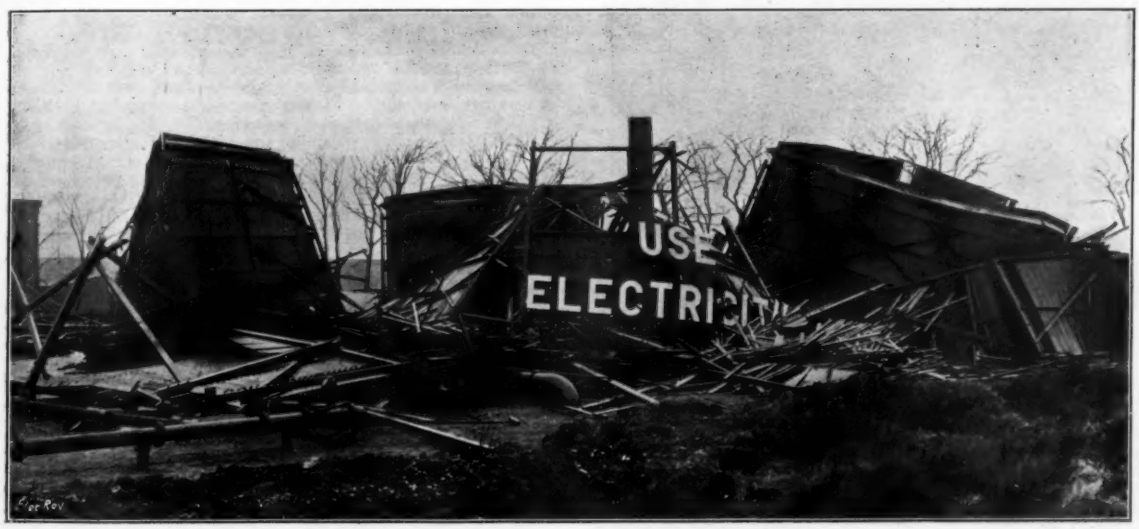
The College Governors invite applications for the award of five open scholarships in the Faculty of Engineering, each of the value of £75 per annum. The scholarships are open to British subjects situate in any part of the Empire, and are tenable at Loughborough College, Leics., England, for the period of the full diploma course. The entrance examination for the session 1928-9 will take place on April 24th, 25th and 26th, 1928. Applicants must be not less than 16 years of age on October 1st, 1928. Candidates resident in the United Kingdom will be required to attend at Loughborough. Candidates resident in other parts of the Empire will be examined on the dates named at local centres where recognised facilities are available, and have been approved by the College Governors. Particulars and application forms may be obtained from the College Registrar, to whom all forms of application must be returned not later than April 1st, 1928.

Royal Scholarships and Free Studentships.

The list of awards for group A (engineering) for the competition for Royal Scholarships and Free Studentships, 1927, of the Board of Education, includes Wm. J. E. Tobin, 19, electrical fitter apprentice, H.M. Dockyard, Portsmouth. Six Royal Scholarships were awarded in this section and three Free Studentships.

Storm Damage.

The accompanying illustration shows the serious damage that was caused at the Blackburn Corporation electricity works at Whitebirk during the gale last week-end, the four water cooling towers were blown over by the wind. It will cost many thousands of pounds to repair the damage. As will be seen, the woodwork was reduced to wreckage. Fortunately, the engineers were able to take advantage of the reciprocal cable from the Ribble station at Preston, and also of the auxiliary plant at Whitebirk. (See also page 774.)



Recent Gale Damage at the Corporation Electricity Works at Whitebirk.

Diesel Engine Users' Association.

At the next meeting of the Association (Friday, November 25th), a paper by Mr. J. E. Hurst, entitled "Centrifugal Castings for Diesel Engines," is to be read and discussed.

The Montefiore Prize Competition.

Recently the jury of electrical engineers charged with the duty of considering papers submitted by candidates for the triennial Montefiore Prize met at Liége and announced the result of the 1926 competition (which was deferred to 1927). It is stated that no prize has been awarded, the works submitted failing to comply with the conditions. The prize, which amounts to 20,500 fr., will be added to that of the next competition, which will take place in 1929, when the total prize-money will be 29,000 fr.

The Electrodeposition of Metals.

The opening meeting of the third session of the Electroplaters' and Depositors' Technical Society took place on October 19th at the Northampton Polytechnic Institute, when Mr. R. H. T. Barklie, M.Sc., delivered a paper on "Stress in Electrodeposited Metals." Mr. Barklie likened a layer of electrodeposited nickel on a rigid cathode to a series of sheets of rubber placed one over the other, the sheets, counting upwards, being stretched to an increasing degree; the resultant stress militated against the adhesion and the ultimate possible thickness of the deposit. Thus the stress was of importance in "building up" worn machine parts by electrodeposition, since distortion might occur and the mechanical strength of the original article might be seriously affected. The magnitude of the stress was of a remarkably high order and, as measured by Mills as far back as 1877, was found to be as follows:—Cadmium, zinc, and nickel distensions of 2.3, 6.2, and 19.2 atmospheres, respectively; iron, silver, and copper, compressions of 18.2, 66.4, and 103.0 atmospheres, respectively.

Details of the bath used were not known, but Stoney in 1909, using a solution of double nickel salts with a current of 0.05-0.11A on an area 102 mm. by 12 mm., obtained a mean tension of 18.1 tons per sq. in. at ordinary temperature, this being reduced to 9.9 tons on raising the temperature to 85 deg. C. The reduction of the stress might also be effected by reducing the amount of co-deposited hydrogen by adding oxidising agents to the bath. Decreasing the acidity and ferrous irons also had their effect, and the use of superposed a.c.'s on the d.c. used for depositing was found to diminish the contraction tendency of the electrodeposit to a very considerable extent. The nature of the stress had been accounted for by Kohlschutter as being due to the dispersion of the metal on a continuous hydrogen phase, a process of grain growth being supposed to take place which was accompanied by contraction. According to Blum and Rawdon, however, the contraction tendency was due to cohesion between the crystal faces of the electrodeposit, conditions giving small crystal size and a high value for the contraction tendency. In the discussion which followed it was pointed out that although the figure for the stress in deposited copper was so high, in practice nickel was found to give far more trouble. The stress in thin deposits was comparatively unimportant, but in thicker deposits, such as in electrotypes, the matter was so serious that the use of nickel was restricted in electrotyping. It was difficult to get rid of the strain *after* deposition, heat treatment being unsatisfactory.

Mr. A. W. Hothersall gave an account of work done at the Woolwich Research Department, where it was found that the maintenance of a comparatively moderate temperature of the solution, *e.g.*, only 30 deg. C., resulted in a very marked reduction in the stress. The influence of colloids in the solution was found to be important, actually considerably increasing the stress, while new solutions were found to give a highly stressed deposit which gradually decreased on working.

The Rights of Research Workers.

The Faculty of Law of North-Western University (administering the income of the Charles C. Linthicum Foundation) announces that the sum of one thousand dollars and a bronze medal, as a first prize, and two sums of one hundred dollars each, as second prizes with honourable mention, will be awarded to the authors of the best essays or monographs submitted by March 1st, 1929, on the subject known as "Scientific Property," *i.e.*, the granting of a quasi-patent right to the discoverer of a principle of science. To be eligible for the award the author must be at the date of submission a member of the bar, or a student registered in a recognised law school, or a patent agent, in any country. The work submitted may be one already published in print at the time of submission. For full particulars address The Linthicum Foundation, North-Western University Law School, McKinlock Campus, 357, East Chicago Avenue, Chicago, Illinois, U.S.A.

An Artificial Larynx.

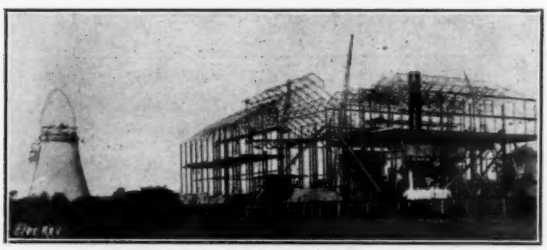
An artificial larynx which enables him to speak with ease has been installed, it is reported by the *Daily Mail*, in the throat of Mr. T. Coleman Du Pont, Senator for Delaware, U.S.A. Recently he had an operation involving the removal of his vocal chords, the larynx, and part of the tongue and windpipe, but by a device perfected three years ago in the laboratories of the American Telephone and Telegraph and of the Western Electric Companies he is still able to talk.

The Severn Barrage.

On October 13th Mr. W. H. Massey, M.V.O., M.Inst.C.E., addressed a meeting of the South Wales Institute of Engineers. According to the *Western Mail*, he described the Severn barrage hydro-electric proposition as a wild-cat scheme, and said the Council should advise the Government that, from steam plant situated in the Glamorgan coalfield, electric power could be supplied at the site of the proposed dam more cheaply than from a tide-mill on the spot. The expense and difficulty of dealing with the sludge and silt, quite apart from interference with navigation, would be prohibitive. Major Ivor David, M.I.E.E., said he calculated that he could produce 500,000,000 kWh at two-thirds of the cost at which they could be produced by a Severn barrage scheme.

Coventry's New Power Station.

The accompanying illustration shows the progress made in the construction of the new station at Coventry, the contract for which was entrusted to the British Thomson-Houston Co., Ltd., Rugby; the specifications were drawn up by Mr. G.



The Coventry Station in Course of Erection.

Tough, O.B.E., M.I.E.E., electrical engineer and manager of the city electricity department. The cooling towers are of reinforced concrete.

Woolwich War Memorial Hospital.

The electrical equipment of this hospital, which was opened on Wednesday last, includes an automatic telephone system, a large number of electric clocks, and a call-bell installation, all of which were supplied by Messrs. Siemens Bros. & Co., Limited, Woolwich. The telephones represent the latest practice in this type of apparatus, and are particularly suitable for hospital use, as they provide a service which is available to the staff at all times without employing an attendant. There are 32 telephones installed at present, but provision has been made in the wiring and central-station apparatus for extending the system to 100 telephones as the hospital extends.

The telephones, clocks, and bells are supplied with current from a common battery of accumulators, which is in duplicate, so that one battery can be charged while the other is in use, thus avoiding any risk of interference or breakdown.

Electricity on the Farm.

"Electric Power as Applied to Farm Machinery" was the subject of an address by Lieut.-Col. Charles Lyon, president of the Cheshire Chamber of Agriculture, at a recent meeting. He said the rural districts did not fully realise the enormous possibilities of electricity and the help it could give farmers as it did to other industries. He had had a most profitable season—the best for ten years—and that was largely due to having electricity. He could not say the profit was great, but the loss was not so great, and the crop-drying could not have been done without electricity. Grade "A" milk could not be provided in badly-lighted shippons and dairies. Power for thrashing was very cheap, and the cost worked out at about 6d. an hour. The meeting agreed that a cheap supply of electricity should be asked for, to be brought within the reach of the rural community with the least possible delay.

Appointments Vacant.

Works foreman for the Borough of Scarborough Electricity Department. Tramway car shed superintendent for the Rangoon Electric Tramway and Supply Co., Ltd. Meter repairer and tester for the Borough of King's Lynn Electricity Department. Assistant station superintendent (Rs. 800 per mensem) for the Madras Electric Supply Corporation, Ltd. Sales manager (£592) for the Hackney Borough Council Electricity Department. One locomotive foreman for the inspection shed, and one for the repair shop of the Indian State Railways (Great Indian Peninsula Railways). Two boiler-house superintendents ($5,100, dollar=2s. 4d.), for the Singapore Power Station. Plumber-jointer, for the Walthamstow U.D.C. Electricity Department. (See our advertisement pages to-day.)

The Great Electrical Hare Competition.

We learn from Mr. R. Robson, clerk to the course, that the following are the numbers of the dogs left in the running after the second heat:—Nos. 2, 5, 6, 7, 10, 15, 16, 22, 28, 30, 37, 38, 42, 44, 48, 58. Those who bought hares which were not lucky enough to be caught by any member of this pack will now do well to make a fresh start, and present at least one hare to each dog—then they will make certain of being in at the finish.

London Traffic Co-ordination.

A report of the London and Home Counties Traffic Advisory Committee was published last week, giving particulars of a scheme for the co-ordination of passenger transport facilities in the London traffic area; it arose out of the suggestion put forward last year that the solution of the traffic difficulties in London was to be found in the extension of the principle of common management and a common fund. The Committee has investigated the subject, and now declares that it is satisfied "that if the proposals set out in this memorandum are accepted, the transport undertakings concerned can be made self-supporting without any increase in the general level of fares now prevailing.

The scheme leaves the ownership of the existing undertakings—underground and other local railways, tramways, and omnibuses—unchanged, but provides for the pooling of the balances of the gross revenues of the undertakings (after payment of working expenses, depreciation, capital charges, &c.), and the distribution of the common fund thus formed—first to meet the deficiency of any party thereto in respect of its revenue liabilities, and afterwards to provide a reasonable return upon the capital invested, in accordance with stated principles.

An essential to success is that the scheme shall embrace all local passenger transport undertakings operating within the London traffic area, and to ensure this result, statutory powers are necessary. If the common fund is established, the Committee considers that the widest facilities for exchange of traffic will become possible, and important economies can be effected; but common management is almost equally essential, and the Committee lays down guiding principles of administration. Public control is provided for, by extending the powers already conferred upon the Minister of Transport, in conjunction with the Advisory Committee. It is believed that with the increased efficiency of operation and the elimination of wasteful competition that would result, the financial situation would enable a programme of continuous development to be carried out, based upon the security of the common fund. Government approval of the scheme in principle is invited by the Committee, as a *sine qua non* to the initiation of the necessary negotiations, and the matter is regarded as of extreme urgency, as the Committee is convinced that no substantial improvement can be effected until some such scheme is in operation. The situation is growing worse daily, and we trust that no time will be lost in placing the Committee in a position to proceed with the work as soon as possible.

The Overhead Lines Association.

On Wednesday evening the Overhead Lines Association held its first regular meeting at the Royal Society of Arts, with Mr. R. Borlase Matthews in the chair. The provisional committee presented its report with regard to the proposed articles of association, the programme for future meetings, financial arrangements, &c., and afterwards a debate on the subject of "Wayleaves" was opened by Mr. W. C. Bexon, chief engineer of the Ayrshire Electricity Board A report of the proceedings will appear in our next issue.

Institution Notes.

The Institution of Civil Engineers.

PRESIDENTIAL ADDRESS.—Mr. E. F. Crosbie Trench, C.B.E., M.A., B.A.I., president, in the course of his inaugural address, assumed that, by choosing a railway engineer for their president, members wished to express their appreciation of the work done by British railways in revolutionising inland transport. The high capital cost involved would appear to preclude the electrification of main lines for some years, but the work of the Central Electricity Board would render great assistance to the railways by facilitating the electrification of suburban services.

The Institution of Electrical Engineers.

INFORMAL MEETING.—The Informal Section inaugurated the new session on Monday, October 24th, with a discussion opened by the President, Mr. A. Page. Mr. H. T. Young was in the chair. The topic Mr. Page had chosen for discussion was "What is required to ensure the Comprehensive Distribution of Electricity?" and the large gathering was given an illuminating survey of the possibilities and prospects

for the electrical industry. He pointed to the claim that gas is available to 95 per cent. of our population, which, of course, does not imply 95 per cent. of the area of the United Kingdom, and with only some 20 per cent. of our population in the more or less rural areas—representing about 90 per cent. of the total area of the country—the difficulty will be to set up a remunerative electrical service in these sparsely populated districts. The solution is brought nearer by the "grid" for two reasons: The increased availability of bulk supply; and the more or less uniform tariff which will probably be charged for such bulk supplies. Success must depend, however, upon our ability to reduce the cost of transmission and distribution sufficiently to enable us to sell at a price which will encourage consumers, and at the same time provide a reasonable return on the capital invested. The best means of ensuring this were suggested, some of the points covered being the standardisation of system and pressure, and the design of overhead lines, as well as an established method of tapping those lines. Mr. Page expressed the opinion that we paid too highly for the standard of excellence which the industry had set up; that application forms were too formidable and complicated for the layman; and that the prospects for supply engineering staffs were good, having regard to the vast developments which were before us.

LONDON STUDENTS' SECTION.—The programme has been issued for the first half of the new session. Mr. R. A. Brockbank is chairman, Dr. R. C. Fox vice-chairman, and Mr. S. H. Hart hon. secretary. The opening address will be delivered at 6.15 p.m. to-day by Capt. J. M. Donaldson, M.C., on "From the Grid to the Consumer." On Thursday next there will be a visit to the Research Laboratories of the General Electric Co., Ltd., Wembley.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

At the Bengeworth Road sub-station of the South London Electric Supply Corporation, Ltd., on October 26th, a presentation was made to Mr. E. A. ULLMANN, M.I.E.E., on his retirement from the company after a service extending over 20 years as resident engineer at the generating station. The presentation, which took the form of an armchair and an engraved salver, was made by Mr. H. W. Sprunt, M.I.M.E., M.I.E.E., late general manager and engineer of the company, who in felicitous terms gave a short historical sketch of Mr. Ullmann's experiences during his service with the company. Mr. Ullmann, in thanking his colleagues, paid tribute to their loyalty to him, to which, in no small measure, he attributed his own success in surmounting the difficulties of pioneer days.

A complimentary dinner to Mr. L. G. HAWKINS, managing director of Kelvinator, Ltd., was given at the Holborn Restaurant on October 26th, with Mr. A. A. Henley in the chair. On arrival Mr. Hawkins was greeted with a fanfare of toy trumpets and crowned as "Big White Chief" with an Indian headgear. Afterwards followed toasts and speeches showing the strides made by the company and paying appropriate tribute to the staff. Mr. Hawkins is retiring from active management of the business, taking the position of chairman of the London board of directors and in future acting in an advisory capacity. Mr. B. H. Morash is taking over the position of general manager.

Mr. L. C. ALEXANDER, second assistant engineer at the Corporation electricity works, Worthing, has resigned, having obtained a position as chief engineer and manager at Dacca, India.

At the works of Messrs. W. H. Allen, Sons & Co., Ltd., Bedford, on October 26th, a bronze tablet to the memory of the late Mr. WILLIAM HENRY ALLEN, D.L., J.P., founder and chairman of the company, the gift of the staff and employés, was unveiled.

On his retirement on superannuation from the service of Preston Tramways Committee, Mr. A. W. KERR, rolling stock superintendent, was presented by the staff and employés with a gold watch and chain, the gifts being handed over by Mr. H. Clayton, general manager.

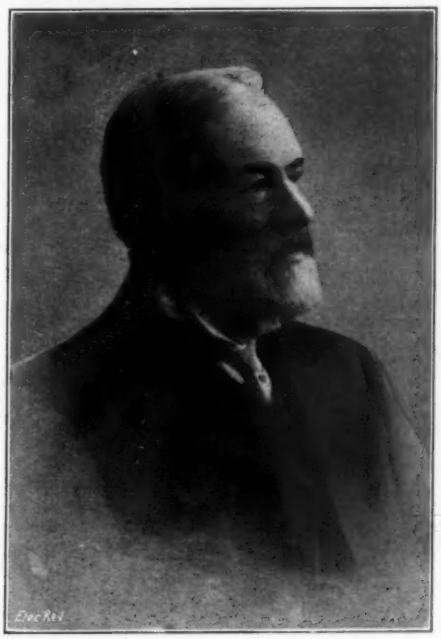
The Liverpool Tramways, Electric Power and Lighting Committee has recommended that Mr. D. V. BESWICK, engineer to the Hightown Electricity Company, be appointed assistant engineer in the Liverpool Electric Supply Department, but not in an established capacity, at £325 per annum.

Mr. CHARLES C. REID, general works manager of the Fife Coal Co., Ltd., has been appointed an additional member of the Safety in Mines Research Board.

Mr. H. PEARCE, until recently chief switchgear designer to the B.T.-H. Co., has severed his connection with that company. He has been engaged in switchgear work for that concern for the past eight years, and previously in a similar capacity with the Metropolitan-Vickers Co. As announced in our advertising pages, he is placing his special knowledge of switchgear problems at the disposal of consulting engineers, power companies, and other organisations.

According to a *Times* dispatch the South African Government has decided to ask Parliament to sanction the payment of a gratuity of £7,500 to Sir WILLIAM HOY on his retirement, on November 11th, from the office of general manager of the Railways of the Union, in recognition of his great services. Sir William's successor will be Mr. J. R. MOBE, at present assistant general manager at Durban.

MR. EDWARD COX-WALKER, M.I.E.E., of Darlington and Sleights, Yorkshire, one of the oldest members of the Institution of Electrical Engineers and a pioneer of the telephone, celebrated his 89th birthday on October 26th. A native of Stockton-on-Tees, he was first in the service of the old Electric Telegraph Co. at York, and then, from 1858 to 1862, was telegraph superintendent for the West Hartlepool Harbour and Railway Co. In 1868, after spending several years in London and Liverpool, Mr. Cox-Walker became manager for Messrs. T. Cooke & Sons, astronomical instrument makers, at York, where he remained until 1880. Towards the end of this period he became interested in Professor Graham Bell's invention of the magneto telephone, and started experimenting. In 1878 he made his first tele-



S. H. Wood] *[Darlington.*

Mr. E. Cox-Walker, M.I.E.E.,
Who has just celebrated his 89th birthday.

phone receivers, and subsequently working in collaboration with the Rev. Henry Hunnings, then curate at Bolton Percy, near York, who had constructed a crude carbon transmitter, produced and patented the Hunnings granulated carbon transmitter. In 1880 Mr. Cox-Walker became a partner in the firm of Harrison, Cox-Walker & Co., electrical engineers, specialising in telephones, electric tell-tales, and mine signalling apparatus. Mr. Cox-Walker continued his experiments with a view to the production of a receiver of greater power than the Bell instruments. He took out patents for several instruments of duplex, quadruplex, and octoplex design. During a visit to Darlington of Mr. G. L. Anders, of the Bell Telephone Co. of America, Mr. Cox-Walker demonstrated to him the Hunnings transmitter, and as the result the patent rights were purchased by the Bell Telephone Co., and also by the London and Globe Telephone Co. Later, Mr. Cox-Walker manufactured Campbell Swinton instruments for the Equitable Telephone Association, Ltd. He extended his business considerably, and about twenty years ago it was formed into a limited company. It now ranks as one of the important electrical manufacturing undertakings of the North. Mr. Cox-Walker retired in 1923, leaving the business in the hands of his two sons, Mr. Edward Cox-Walker and Mr. Meredith Cox-Walker. He continues to enjoy excellent health.

Obituary.—MR. OLAF TROST.—The death took place in a London nursing home on October 26th, of Mr. Olaf Trost, electrical and structural engineer, who had been associated with Marconi's Wireless Telegraph Co., Ltd., for many years. Mr. Trost was 42 years of age and a Dane, and with the exception of an interval of three years he had been in the employ of the company since 1911. He was a specialist in mast design, and during the last few years he had devoted his attention to the design of 800-ft. masts for high-power wireless stations, and the 300-ft. masts used for the Imperial wireless beam stations. At the time of his death he was employed on behalf of the Marconi Company in erecting masts at Daventry for the British Broadcasting Corporation.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Modern Radio, Ltd. — Private company. Registered October 26th. Capital, £200 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in all kinds of wireless and electrical apparatus, &c. The first directors are:—B. A. Mahomet, 25, Nicholson Street, New Wortley, Leeds; F. H. Murgatroyd, 8, Paisley Terrace, Upper Armley, Leeds. Qualification: 10 ordinary shares. Registered office: 27, Queen Victoria Street, Leeds.

Aberdeen Suburban Tramways Co., Ltd.—Registered in Edinburgh under the Companies' Acts on October 22nd, 1927. Formerly constituted under the Aberdeen Suburban Tramways Confirmation Act, 1902. Capital, £72,000 in £1 shares. The objects are to carry on the business indicated by the title. The first directors are:—J. Mearns, 295, Great Western Road, Aberdeen, merchant; W. Christie, 6, Marine Terrace, Aberdeen, medical practitioner; A. T. Dawson, 21, Rubislaw Den, North Aberdeen, warehouseman. Secretary: A. Wilson. Registered office: 15, Golden Square, Aberdeen.

Rubber Electro Deposition Patents, Ltd.—Registered as a private company on October 24th, with a nominal capital of £9,000 in £1 shares. The objects are to acquire letters patent, *brevets d'invention*, concessions, licences, inventions, rights and privileges, and to carry on the business of rubber manufacturers and makers of, and dealers in articles of all kinds made or prepared with india-rubber; electro depositors of rubber. The first directors are:—A. O. Davies, "Heatherfield," Weybridge; W. A. Williams, 1, Lennox Street, Edinburgh; A. Johnston, Castle Mills, Edinburgh (managing director of North British Rubber Co., Ltd.). Qualification, 500 shares. Solicitors: Cameron, Kemm and Co., 24, Old Broad Street, E.C.2.

T. A. Keating, Ltd.—CORRECTION.—In our last issue the name and occupation of the last-named director of this company was incorrectly stated. He should have been described as "R. H. Miskin, 69, Flaxton Road, Plumstead, S.E.18, wireless engineer."

Official Returns of Electrical Companies.

J. V. Brittain & Company, Ltd.—Mortgage debenture dated October 13th, 1927, to secure £300, charged on the company's undertaking and property, present and future, including uncalled capital (if any) and book debts. Holder:—G. H. Alexander, 83, Coleshill Street, Birmingham.

Satisfaction in full on October 12th, 1927, of mortgage debenture dated October 14th, 1926, securing £1,172.

Whitfield Electrical Co., Ltd.—F. Wilcock, of 1, Great Winchester Street, E.C.2, was appointed receiver and manager on October 5th, 1927, under powers contained in debenture dated August 29th, 1925, and ceased to act as such on October 7th, 1927.

Central Power Engineering Co., Ltd.—Debenture dated October 2nd, 1927, to secure £1,499, charged on the company's undertaking and property, present and future, including uncalled capital. Holder:—A. L. Hodges, Brook House, Riseley, Beds.

Chloride Electrical Storage Co., Ltd.—Capital, £500,000 in 62,000 preference, 329,625 ordinary, and 108,375 unissued shares of £1 each. Return dated June 11th, 1927. 62,000 preference and 329,625 ordinary shares taken up. £75,738 paid on 48,750 preferred and 26,988 ordinary shares, £315,887 considered as paid on the remainder. Mortgages and charges, nil.

Tudor Accumulator Co., Ltd.—Capital, £100,000 in 8,800 "A" and 1,200 "B" shares of £10 each. Return dated June 10th, 1927. All shares taken up. £29,000 paid, being £10 per share on 2,600 "A" and £2 10s. per share on 1,200 "A." £71,000 considered as paid, being £10 per share on 5,000 "A," £7 10s. per share on 1,200 "A," and £10 per share on 1,200 "B" shares. Mortages and charges, nil.

Callender's Cable and Construction Co., Ltd.—Capital £1,800,000 in 1,000,000 ordinary, 400,000 preference, and 400,000 "B" preference shares of £1 each. Return dated July 14th, 1927. 800,000 ordinary, 400,000 preference, and 400,000 "B" preference shares taken up. £1,125,000 paid, £475,000 considered as paid. Mortgages and charges: £300,000.

Shanghai Electric Construction Co., Ltd. — Capital, £500,000 in £1 shares. Return dated June 15th, 1927. All shares taken up. £417,000 paid, £83,000 considered as paid. Mortgages and charges, nil.

Chamberlain & Hookham, Ltd.—Capital, £100,000 in 9,500 preference and 10,500 ordinary shares of £5 each. Return dated July 12th, 1927. 8,000 preference and 10,100 ordinary shares taken up. £36,990 paid on 7,298 preference and 100 ordinary shares, £53,510 considered as paid on 702 preference and 10,000 ordinary shares. Mortgages and charges, nil.

Bailey & Clapham, Ltd.—Debenture dated October 4th, 1927, to secure £2,600 charged on the company's undertaking and property, present and future, including uncalled capital. Holders: Mrs. M. Clapham, Ferncliffe Villas, Keighley; and F. W. Weatherhead, 55, Cliffe Street, Keighley.

Yorkshire (Woollen District) Electric Tramways, Ltd.—Capital, £500,000 in 250,000 preference and 250,000 ordinary shares of £1 each. Return dated June 7th, 1927. 220,000 ordinary shares taken up. £220,000 paid. Mortgages and charges: £34,800 issued to bankers as collateral security.

Veritys, Ltd.—Capital, £196,000 in 7,000 5 per cent. cum. pref. and 7,000 6 per cent. cum. pref. shares of £10 each, 7,000 7 per cent. preferred ordinary shares of £7 10s. each, and 70,000 deferred ordinary shares of 1s. each. Return dated June 9th, 1927. All shares taken up. £137,701 10s. paid on 4,670 5 per cent. preference, 7,000 6 per cent. preference, 2,800 preferred ordinary, and 30 deferred ordinary shares. £58,298 10s. considered as paid on 2,330 5 per cent. preference, 4,200 preferred ordinary, and 69,970 deferred ordinary shares. Mortgages and charges, £84,637 17s. 6d.

Anglo-American Telegraph Co., Ltd.—Capital stock, £7,000,000 in £296,580 ordinary stock, £3,351,710 preferred ordinary stock, and £3,351,710 deferred ordinary stock. Return dated May 24th, 1927. All stock taken up. £600,000 paid, £6,400,000 considered as paid. Mortgages and charges, nil.

Nathan & Allen, Ltd.—Capital, £10,000 in £1 shares. Return dated May 30th, 1927. 3,450 shares taken up. £1,100 paid. £2,350 considered as paid. Mortgages and charges, nil.

City Notes.

Drake & Gorham, Ltd.

The annual meeting of this company, whose report was reviewed in our issue of October 21st (p. 708), was held on October 25th. Mr. B. M. Drake (chairman), who presided, said that the company had maintained its profits and dividend. They were continually looking for fresh fields for their activities, and a small syndicate had been formed to exploit an electric tea drier invented by Mr. Hamlyn Drake. The experimental machine had been sent to Ceylon for practical trials, and the manufacturing rights had been retained for the company. They had also acquired the selling rights of a domestic water softener, and were dealing with an air-pressure pumping system. Mr. Drake then dealt with the merits of the private generating plant, employing oil engines, as compared with a public supply of electricity. He then mentioned the names of a number of leading architects and consulting engineers with whom the company had completed contracts, and read a list of distinguished people and institutions for whom work had been carried out. Among the contracts which he specifically mentioned were a lighting and power installation for a new artificial silk factory in Northern Ireland; the lighting of 20 branches of a leading bank; and an important contract for the complete distribution system for lighting, heating, power, cooking, telephones, bells, &c., for the new Bank of England. They had to provide for approximately 10,000 lights and 40 lifts. The main switchboard, comprising 45 panels with an overall length of 100 ft., as well as the distribution boards, would be made at the company's own works. They had equipped several further hospitals for radio reception, and had installed receiving sets for many private users. Their works had supplied switchboards to most of the Government departments, and to Marconi's Wireless Telegraph Co., Ltd., the North Metropolitan, and other supply companies, and high-pressure switchgear for the Michelin Tyre Co.'s new factory, and others.

Fellows Manufacturing Co., Ltd.

Capt. H. F. Jackson (chairman) presided at the statutory general meeting on October 25th, and referred to the death of the late chairman, Mr. V. L. Fellows. He said that the deceased gentleman and Messrs. D. and S. Fellows were entitled to great credit for having switched over the company

from the non-paying business of magneto manufacture to the production of radio apparatus. The new company started with fresh capital of £53,855, and the shareholders of the old company had taken up shares to a satisfactory extent. Against the capital (£126,675) there were very substantial assets; goodwill was valued at only about £20,000. The profits of the company from January 1st to July 25th, the date of the company's incorporation, would be used to meet the liabilities of the old company. The new company had no preliminary expenses to be written off. The turnover had increased very satisfactorily, and it was expected to grow still further. Orders were being received at such a rate that it was difficult to satisfy them. The company was selling directly to the public, thus saving heavy commissions and obtaining better control of the business. The hire-purchase side of the business was increasing in a satisfactory way. As a result of the Wireless Exhibition an enormous number of inquiries had been received.

Electric Supply Co. of Victoria, Ltd.

The gross profit for the year ended March 31st last was £58,402, as compared with £57,904 for the preceding year. After providing for taxation, &c., and adding £46,851 brought forward, £100,019 is available. From this is paid note interest and sinking fund, £8,757 is written off preliminary expenses, £25,000 is transferred to special reserve, and after paying the preference dividend, £37,362 is carried forward. The directors state that information received from Australia has led them to decide to pass the ordinary dividend; 10 per cent. was paid last year.

Electrolytic Zinc Co.

The Melbourne correspondent of the *Financial Times* says that at the annual meeting the chairman (Mr. W. H. Baillieu) referred to the increased efficiency and output of the company, and said that unless any unforeseen contingency occurred the company would be able to maintain the present rate of dividend.

Tube Investments, Ltd.

The directors recommend a dividend of 10 per cent. on the ordinary capital for the past year. They also propose to increase the capital to £2,000,000 by the creation of £750,000 of shares and to capitalise £181,523 of the reserves and issue it as fully-paid ordinary shares to existing ordinary shareholders in the proportion of one new share for each three held. A further £181,523 is to be issued in the form of £1 ordinary shares at the price of 22s. 6d. each; these will be offered to present shareholders in the proportion of one to three.

Erinoid, Ltd.

The trading profit for the year ended August 31st last was £26,999, and the net profit was £17,069, as compared with £30,335 in 1925-26. The addition of the balance brought forward and the dividend received from the Cie. Française de l'Omnilith makes available £25,081. It is proposed to pay a final ordinary dividend of 4 per cent., making 7 per cent. for the year (against 10 per cent.), and to transfer £1,547 to general reserve, £2,500 to taxation reserve, and £250 to staff fund, leaving £6,992 to be carried forward. During the year the directors borrowed £10,000 on favourable terms and paid off the debentures. The balance of the share capital was issued at a premium of 2s. 3d. per share.

Marconi's Wireless Telegraph Co., Ltd.

The following statement has been issued by the board:—"The attention of the Marconi Company has been called to reports to the effect that the company has come to an arrangement with the cable companies or is discussing such an arrangement, and that the opposition to the company's petition for the Court's approval of its capital reduction scheme has been withdrawn. In view of the extent to which these rumours have been circulated, the company thinks it necessary to state that there is no foundation for either of them. The company's capital reduction scheme petition is down for hearing on Monday, November 7th."

Stock Exchange Notices.

Dealings in the following have been specially allowed by the Committee under Rule 159:—

Fellows Manufacturing Co., Ltd.—25,000 preferred ordinary shares of 10s. each, partly paid and fully paid, Nos. 142,456 to 167,455. 25,000 deferred ordinary shares of 2s. 6d. each, partly paid and fully paid, Nos. 440,234 to 465,233.

The undermentioned have been ordered to be officially quoted:—

Lisbon Electric Tramways, Ltd.—262,691 ordinary shares of £1 each, fully paid, Nos. 634,027 to 896,717.

Ever-Ready Co. (Great Britain), Ltd.

The directors have declared interim dividends for the half-year ended September 30th, as follows:—At the rate of 10 per cent. per annum on the preference shares and 10 per cent. actual on the ordinary shares.

Meters, Ltd.

An interim ordinary dividend of 2½ per cent. has been declared, against 2 per cent. last year.

United Electric Tramways Co. of Caracas, Ltd.

The report for the year ended June 30th last shows a net revenue of £24,798 (against £27,512), and to this is added £33,308 brought forward, making £57,906. The directors propose to pay a dividend of 10 per cent., as in 1925-26, and to carry forward £40,906. Reference is made in the report to the competition which the company is meeting from omnibuses.

Agar, Cross & Co., Ltd.

Out of a profit of £289,334 (against £305,340) the directors have again declared a total dividend of 16 per cent., free of tax, on the ordinary shares. The final distribution is 11 per cent. (including 5 per cent. bonus).

Joseph Lucas, Ltd.

The net profit for the past year was £226,092 (against £179,120). An ordinary dividend of 15 per cent., with a bonus of 10 per cent., is again being distributed (5 per cent. already paid).

Coventry Chain Co., Ltd.

A final dividend of 5½ per cent. has been declared, making 7½ per cent. for the year, against 10 per cent.

Johnson & Phillips, Ltd.

An interim dividend of 5 per cent. has been declared on the ordinary shares, as in 1926.

Belgian Company.

Société International d'Energie Hydro-Electrique ("*Sidro*").—The following dividends have been declared for 1926-27:—Preference and ordinary shares 47 fr. per share (against 35.25 fr.); founders' shares 171.83 fr. per share (against 110.45 fr.).

Stocks and Shares.

MONDAY EVENING.

WILD movements in prices continue to characterise some of the Stock Exchange markets in which speculative accounts are known to exist. The present business week is broken by the holiday on Tuesday, as to whose origin only guesses at truth can be made. The interruption did something to emphasise the greater caution in speculation which prevails to-day as compared with a month ago. Money gives no sign of reluctance to seek Stock Exchange markets for its employment; the investment stocks and shares manifest decided strength, and this in spite of an increasing volume of new issues, some gilt-edged; others, dependent upon prospects, silver-lined. Prior-charge stocks of the various electric railways are in demand, and, in some cases, are almost impossible to buy because of the tenacity with which they are held by investors.

Mercurial Marconis.

The liveliest market, apart from those concerned with artificial silk and tobacco shares, has been that for Marconi ordinary. The price, after its 10s. jump last week, rose still further, touching 38s. Next day it was 32s. 6d.; the day after, 27s. 6d. The sudden collapse followed upon a categorical denial by the company of rumours as to an agreement having been reached between the Marconi and the cable undertakings. Other reports were also contradicted in the same statement. Bulls of the shares rushed to get out while they could. The market seethed with an excitement not witnessed for years past. Fitful rallies occurred every now and then, and the price this, Monday, night, left off officially at 28s. 9d.; actually 26s. 6d. The company's case, in connection with the proposed reorganisation of capital which is, of course, opposed by some of the proprietors, comes before the Court in a few days' time. Side by side with the fluctuations in the parent shares, Canadian Marconis have been moving in dramatic fashion. They were 7s. 6d. when last we wrote; rose to 8s. 6d. for five minutes, and were 7s. soon afterwards; then rallied to 7s. 9d. on American purchases. The next move left them at 7s. 1½d. Marconi Marines were wanted at 34s., went back to 30s. 6d., and recovered to 31s. 6d.

The Dangers of Speculation.

The mercurial movements in Marconis provided a text from which perfectly correct purists have moralised at great length upon the dangers of speculation. Possibly the remarkable rises recently secured by some of the cable-equipment shares might fall into the category of those caused by indiscriminate purchases. No sensible person will commend mere gambling in stocks and shares. Its results are usually disastrous to everyone concerned. But the Marconi outburst was more than a wild toss-up, and, as for the substantial gains that have lately occurred in the list of construction companies' shares, these are based upon intelligent anticipation of developments which are quite likely to occur in the industry itself. The public nowadays want more lively interest than is provided by high-class securities, and, so long as the capitalist puts

a substantial proportion of his money into the safest stocks, he can hardly be blamed for taking risks with part of the remainder.

Cable and Telephone.

Leaving the primrose, if thorny, path of speculation, it is to be observed that the Eastern cable stocks have given way again, in consequence of the attention paid to wireless shares. Great Northerns are up £1; Indo-Europeans, allowing for deduction of the dividend of 12s. 6d. net, are easier. United River Plate Telephones at 10 11/16 ex 3s. net, have lost about an equal amount. On the other hand, Automatic Telephones strengthened to 48s.

British Columbia Electric.

British Columbia Electric Railway deferred forges its way towards 200, and at 190 is 5½ points higher. The preferred has gained 8½, at 148, and the preference stock 2, at 93½. Even the rarely-moving 4½ per cent. debenture stock is up 1, at 80½. Some people think that the rises in the deferred and preferred stocks have gone far enough, but the fact remains that demand is as persistent as it is constant. It is not surprising that inquiry should be raised as to the possibility of a bonus which might take the shape of a new issue of stock at a price well below that current for the existing security. Brazilian Tractions have been jumping up and down like a child's jack-in-the-box; the common shares, after their last week's drop of 20 points, regained 2½, and the 6 per cent. preference at 164 have put on a similar amount.

The Tubes.

Home Railway stocks make a very humdrum showing in comparison with some of the more popular descriptions. Metropolitan consolidated went up to 60, and Districts to 63½. Central London assented ordinary is harder at 71, stock changing hands several times at that price. The non-assented ordinary stands at 58½, the preferred at 65½, and the deferred at 54½. The assented guaranteed stocks of the last two, preferred and deferred, are quoted at 71. London Electric consolidated ordinary was last dealt in at 62, some ten days ago, and the company's 4 per cent. debenture stock attracted business on the basis of 81. The four 5 per cent. preference stocks of the City and South London Railway are quoted between 86 and 90; London Electric 4 per cent. preference can be bought at 72½ or thereabouts. District 4½ per cent. first preference is 76½, and the company's assented 3½ per cent. preference, guaranteed by the Underground Electric Railways of London, is 60. The other issues of the Underground Railways show no alteration on balance, although the £1 shares touched 19s. before recovering to 19s. 6d.

Supply and Power.

Electricity supply shares remain firm, with hardly a ripple of movement amongst the prices of the home companies' issues. Urban ordinary and preference regained most of the dividends deducted last week from the prices. A little business in Newcastle-on-Tyne ordinary served to raise the price a few pence. The new ordinary kept pace with the old, and at 21s. 9d. are practically the same price as the others, allowing for the small difference in the dividend between the two. Of the shares outside the home circle, Atlas Power have been raised to 17s., the preference to 21s. 3d. Madras Electric are better at 32s. 6d. Perak River Power shares provided interest with a rise to 12s. 9d., and North Wales Power came into notice on an advance to 14s.

London Traffic Shares.

Interest in the London traction descriptions has become rather less marked, but London and Suburban Tractions are better at 4s. London United preference show a slight gain at 9s. 3d., and the ordinary maintain their previous figure of 2s. 3d. Around the London traffic problem a considerable degree of speculation is proceeding. The optimists look far ahead in their anticipations of some scheme that shall give the existing preference shares of the London tramway undertakings the character of "rent-charge" securities. However, the prices of the more familiar issues are sufficiently low to hold out attraction to the speculator who is prepared to lock them up for an indefinite period. In the foreign tramway group, La Plata preference are firmer at 21s. 3d., and business has been done several times at 5s. in the ordinary shares. Para Electric Tramways 6 per cent. preference rose to 12s. 6d.; the dividend, which is cumulative, has been in arrears for six years. The ordinary shares stand at 4s.

Manufacturing Shares.

General Electrics are a good market, the ordinary and the 6½ per cent. preference both being 1s. up at 34s. 6d. and 24s. 6d., respectively. Callenders are unchanged at 3 15/16, having recovered their dividend. Babcocks are also ex dividend, at 58s. English Electric preference drooped to 13s. The market, as a whole, keeps its ground very well, in the face of somewhat depressing conditions amongst industrial shares. Vickers came on offer at 12s. The rubber share market gives an occasional flutter of activity, the price of the raw material being a shade better. But the Stock Exchange is disposed to heaviness on balance, and, with business quieter than it was, people ask each other whether the industrial boomlet of 1927 may be considered to have come to an end.

Share List of Electrical Companies.

	Nom. £	Dividend. 1925.	Dividend. 1926.	Price Oct. 31 1927.	Rise or fall.	Yield. p.c.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	14	14	58/3	—	4 15 9
Brompton Ordinary	1	10	8⅝	24/6	—	5 14 8
Charing Cross Ordinary	1	15	8½	25/6	—	5 9 10
do. do. 4½ Pref.	1	4½	4½	17/6	—	5 2 10
Chelsea	1	12	8⅝	24/6	—	5 14 8
City of London	1	15	7½	28/9	—	4 17 5
do. do. 6% Pref.	1	6	6	22/6	—	5 6 8
Clyde Valley	1	8	8	32/6	—	4 18 6
County of London	1	15	7½	27/-	—	5 3 8
do. do. 6% Pref.	1	6	6	22/6	—	5 6 8
Edmundson's Ordinary	1	8	10	38/9	—	5 3 3
do. 7% Pref.	1	6	7	24/6	—	5 14 3
Elec. Supply Corporation	1	10	10	32/6	—	6 3 0
Kensington Ordinary	1	15	8	25/6	—	5 9 10
Lancs. Light and Power	1	7½	7½	27/-	—	5 11 1
London Electric	1	10	8½	24/6	—	5 14 2
do. do. 6% Pref.	5	6	6	5⅝	—	5 11 3
Metropolitan	1	11	8	30/-	—	4 13 4
do. 4½% Pref.	1	4½	4½	17/-	—	5 6 6
Midland Counties	1	5½	6	24/-	—	5 0 10
Newcastle-on-Tyne Ordinary	1	7	5	22/-	—	4 11 0
do. 5% Pref.	1	5	5	17/6	—	5 14 3
do. 7% Pref.	1	7	7	25/-	—	5 12 0
Notting Hill 6% Pref.	10	6	6	10⅝	—	5 11 7
North Met. Elec. 6% Pref.	1	6	6	22/-xd	—	5 9 1
St. James' and Pall Mall	5	17½	8	25/6	—	5 9 10
South London	1	15	8½	26/-	—	5 12 0
South Metropolitan Pref.	1	7	7	1¼	—	6 8 0
Urban Ordinary	1	7	7	1⅜xd	+6d.	4 6 2
do. 6% Pref.	1	6	6	1¼xd	+6d.	5 13 0
Westminster Ordinary	1	15	8½	25/-	—	5 12 0
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	21/-	—	7 2 10
Yorkshire Elec.	1	8	8	31/6	—	5 3 0
HOME RAILS.						
Central London Ord. Assented	Stock	4	4	71	+1	5 12 8
Metropolitan	,,	5	8	60	+1	5 0 0
do. District	,,	9½	9½	63½	+1	5 10 3
Underground Electric	£1	Nil	1½	19/6	—	1 10 9
do. do. Income	Bonds	6	6	104	—	5 15 5
TELEGRAPHS AND TELEPHONES.						
Anglo-Am. Tel. Pref.	Stock	6	6	104	—	5 15 5
do. Def.	,,	1½	1½	25	—	6 0 0
Automatic Telephone	1	8	10	48/-	+1/-	4 3 4
Chili Telephone	5	5	6	7⅜	—	8 18 3
Eastern Extension	10	10	10	17½	−¼	*5 14 8
Eastern Tel. Ord.	Stock	10	10	173	−2½	*5 15 7
Globe Tel. and T. Ord.	10	10	10	17⅜	−¼	*5 13 4
do. do. Pref.	10	6	6	10¼	—	5 10 4
Great Northern Tel.	10	20	20	36½	+1	5 9 7
Indo-European	25	8½	10	43½xd	−⅜	*5 14 11
Marconi	1	Nil	Nil	28/9	−6/3	... ...
Marconi-Marine	1	7½	8⅜	31/3	+1/3	5 12 0
Oriental Telephone Ord.	1	12	12	52/6	—	*4 9 4
United R. Plate Tel.	5	8	8	10½	−3/8	*4 14 10
Western Telegraph	10	10	10	17½	−¼	*5 14 8
HOME AND FOREIGN TRAMS, &c.						
Anglo-Arg. Trams First Pref.	5	5½	5½	8½	—	7 17 2
do. do. 2nd Pref.	5	6	6	8⅞	—	8 8 6
do. do. 5% Deb.	Stock	5	5	74½	+1	6 14 3
British Electric Traction Def. Ord.	,,	8	8	500	—	... ...
do. do. 8% Pref. Ord.	,,	6	8	124½	+4	6 8 6
Brazil Traction	100	5	6	196xd	+2½	3 1 3
Brit. Columbia Elec. Ry. Pcc.	Stock	5	5	93½	+2	5 6 11
do. do. Preferred	...	6⅝	6½	148	+8½	4 14 2
do. do. Deferred	,,	...	8	190	+5½	*4 4 8
do. do. Deb.	,,	4½	4½	80½	+1	5 5 11
London & Sub. Trac. 5% Pref.	1	Nil	Nil	9/6	—	Nil
London United Tram. Deb.	Stock	4	4	56½	—	7 1 7
Mexico Trams, 6% Bonds	—	5	5	76	—	6 11 7
Mexican Light Common	100	Nil	Nil	53	—	Nil
do. Pref.	100	Nil	Nil	72xd	−1	Nil
do. 1st Bonds	—	5	5	77½	—	6 7 6
Yorkshire (West Riding)	1	6	—	7/6	—	... ...
MANUFACTURING COMPANIES.						
Babcock & Wilcox	...	13	13	58/-xd	+3d.	4 9 8
British Aluminium Ord.	1	19½	10	44/6	—	4 9 11
British Elec. Transformer Pref.	1	Nil	7	18/8	—	7 13 6
British Insulated Ord.	1	15	15	8½	—	3 16 2
Brush Ord.	1	10	10	28/9	—	6 16 4
Callenders	1	15	15	3 15/16xd	+9d.	3 16 2
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Parkinson Pref. Ord.	1	Nil	Nil	16/-	—	... ...
Edison-Swan	£/-	10	10	10/-	—	4 0 0
do. 5% Deb.	Stock	5	5	90	—	5 11 1
Electric Construction	1	10	7½	38/9	—	5 4 4
Enfield Cable Pref.	1	7½	7½	25/-	—	6 0 0
English Electric	1	Nil	Nil	10/-	—	... ...
do. do. Pref.	1	8	—	13/-	−6d.	... ...
Gen. Elec. Pref.	1	6½	6½	24/6	+1/-	5 6 1
do. Ord.	1	7½	7½	24/6	+1/-	4 6 1
Henley	20	25	5⅝	—	4 13 0
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	5	5	20/6	—	*4 17 7
Johnson & Phillips	1	17½	12½	50/-	—	5 0 0
Met.-Vickers Ord.	1	8	8	32/9	—	5 11 5
do. Pref.	2	6	6	2⅛	—	6 4 8
Siemens Ord.	1	7	7½	32/6	—	4 9 6
Telegraph Construction	15	10	10	20½	—	*4 1 7

* Dividends paid free of Income Tax.

Electrical Imports and Exports of Japan.

Figures for 1925 and 1926 Compared.

THE following statement shows the import and export trade of Japan in 1925 and 1926, in electrical and similar goods. It will be noticed that, except for turbines, Japan is a decreasing importer of such products. At the same time, her exports of machinery show a small decline, while those of lamps and insulated wire have increased. There are signs that Japan's export trade in electrical and similar appliances is not now spread over so many markets as in the past.

Imports.

	1925.	1926.	Inc. or dec.
Submarine telegraph or telephone cable—			
Total (all from Great Britain)	1,502	307	−1,195
Other insulated electric wires—			
Total	968	1,121	+ 153
From United States	114	72	− 42
„ United Kingdom	641	12	− 629
„ Germany	203	1,034	+ 831
Steam turbines—			
Total	1,451	2,561	+1,110
From United States	829	1,629	+ 800
„ United Kingdom	335	279	− 56
„ Germany	63	77	+ 14
„ Sweden	68	—	− 68
„ Switzerland	63	481	+ 418
„ France	42	91	+ 49
Parts of steam turbines—			
Total	304	652	+ 348
From United Kingdom	65	392	+ 327
„ Sweden	19	50	+ 31
„ United States	120	93	− 27
„ Switzerland	77	105	+ 28
Internal-combustion engines—			
Total	5,731	4,398	−1,333
From United Kingdom	1,319	554	− 765
„ Sweden	174	37	− 137
„ United States	1,986	2,980	+ 994
„ Germany	524	331	− 193
„ Switzerland	1,496	227	−1,269
„ France	94	79	− 15
Steam engines—			
Total	59	31	− 28
From United Kingdom	8	22	+ 14
„ United States	40	1	− 39
„ Germany	8	7	− 1
Steam boilers and parts—			
Total	5,839	4,875	− 964
From Switzerland	1,077	432	− 645
„ United Kingdom	4,040	3,583	− 457
„ United States	423	500	+ 77
Dynamos, motors, transformers, &c.—			
Total	11,981	10,690	−1,291
From France	123	89	− 34
„ United Kingdom	1,551	1,141	− 410
„ Sweden	78	42	− 36
„ United States	7,250	7,374	+ 124
„ Switzerland	993	540	− 453
„ Germany	1,961	1,320	− 641
Dynamos combined with motive machinery—			
Total	901	662	− 239
From United Kingdom	424	217	− 207
„ United States	20	86	+ 66
„ Germany	—	157	+ 157
„ Switzerland	455	200	− 255
Telegraphic and telephonic instruments and parts—			
Total	16,924	9,811	−7,113
From United Kingdom	6,395	3,202	−3,193
„ France	114	59	− 55
„ Denmark	12	22	+ 10
„ United States	6,702	4,427	−2,275
Water turbines and Pelton wheels—			
Total	772	2,209	+1,437
From United Kingdom	44	—	− 44
„ France	42	—	− 42
„ Switzerland	435	425	− 10
„ Sweden	46	629	+ 583
„ United States	—	333	+ 333
Lamps, lanterns and parts—			
Total	738	702	− 36
From United Kingdom	104	93	− 11
„ United States	394	398	+ 4
„ Germany	216	181	− 35
Wattmeters—			
Total	2,270	825	−1,445
From United Kingdom	34	1	− 33
„ Germany	1,815	451	−1,364
„ United States	147	158	+ 11
„ France	2	4	+ 2
„ Switzerland	269	197	− 72
Other meters—			
Total	2,608	2,457	− 151
From United Kingdom	668	396	− 272
„ United States	999	1,368	+ 369
„ Germany	723	542	− 181
„ France	123	99	− 24

Exports.

	1925.	1926.	Inc. or dec.
Electrical machinery and parts thereof—			
Total	2,131	2,099	− 32
To China	458	453	− 5
„ Kwantung Province	1,221	1,403	+ 182
„ Hong Kong	185	31	− 154
„ British India	89	49	− 40
„ Straits Settlements	39	64	+ 25
„ Dutch India	8	8	—
„ Asiatic Russia	1	1	—
„ Philippine Islands	13	10	− 3
„ Siam	2	9	+ 7
„ France	4	—	− 4
„ United States	41	5	− 36
„ Argentina	4	—	− 4
„ Cape Colony and Natal	1	—	− 1
„ Australia	49	51	+ 2
„ New Zealand	5	—	− 5
Telephones and parts thereof—			
Total	353	251	− 102
To China	31	46	+ 15
„ Kwantung Province	316	166	− 150
„ Great Britain	—	11	+ 11
„ Asiatic Russia	2	6	+ 4
„ France	—	14	+ 14
Electric lamps—			
Total	2,222	2,955	+ 733
To China	255	485	+ 230
„ Kwantung Province	234	477	+ 243
„ Hong Kong	98	60	− 38
„ British India	24	62	+ 38
„ Straits Settlements	37	41	+ 4
„ Dutch India	10	9	− 1
„ French Indo-China	—	3	+ 3
„ Siam	4	20	+ 16
„ United Kingdom	7	12	+ 5
„ France	64	6	− 58
„ United States	1,298	1,485	+ 187
„ Canada	154	243	+ 89
„ Argentina	1	19	+ 18
„ Australia	2	8	+ 6
„ Philippine Islands	3	11	+ 8
Insulated electric wire—			
Total	1,774	1,863	+ 89
To China	577	464	− 113
„ Kwantung Province	688	1,023	+ 335
„ Hong Kong	73	33	− 40
„ British India	59	6	− 53
„ Straits Settlements	30	4	− 26
„ Dutch India	152	100	− 52
„ Siam	67	140	+ 73
„ United States	3	—	− 3
„ Chile	70	42	− 28
„ Argentina	22	41	+ 19
Steam boilers and parts—			
Total	175	208	+ 33
To China	86	32	− 54
„ Kwantung Province	89	136	+ 47
„ Asiatic Russia	—	35	+ 35

German Electrical Porcelain Exports.

The export trade of German makers of porcelain for electrical purposes is stated to have fallen far short of the level reached in the previous quarter. The French market, which used to be an important outlet, is not expected to come up to expectations despite the reduction in the import duties under the new commercial agreement. On the other hand, lower duties have been conceded to Germany by Austria so that exports to that country should be more favourable.

G.E.C. Showroom Extensions.

Continuous Window Demonstrations.

MOST of our London readers and many from further afield have already visited the excellent showrooms of the General Electric Co., Ltd., at Magnet House, Kingsway, W.C., or have at least stopped to admire the windows and the floodlighting of the premises. Now the company has provided an additional attraction in the form of continuous demonstrations of electric washing, sewing, sausage-making, &c., in the windows of a recently-opened extension of the showrooms. The effectiveness of the innovation is testified to by the large crowds which assemble outside the windows.

The new showrooms (fig. 1) are in the same block as Magnet House and communicate with it in the basement. On the corner of Keeley Street and extending some way into that thoroughfare is a large apartment (fig. 2) in which many examples of the company's lighting fittings and domestic appliances are attractively displayed. Two sides of this consist entirely of windows behind which runs a platform. Young ladies wearing the "Miss Magnet" dress are stationed on this platform and have charge of various "Magnet" appliances which are demonstrated. One is busily engaged with a sewing machine; another assiduously gathers French chalk from a strip of carpet with a suction cleaner; and a third puts a "Wizard" through its paces. The last machine, it will be remembered, is a sort of maid-of-all-work which washes and wrings clothes; minces meat and makes sausages; cleans knives; and produces ice-cream—not simultaneously, of course, for the results might be curious.

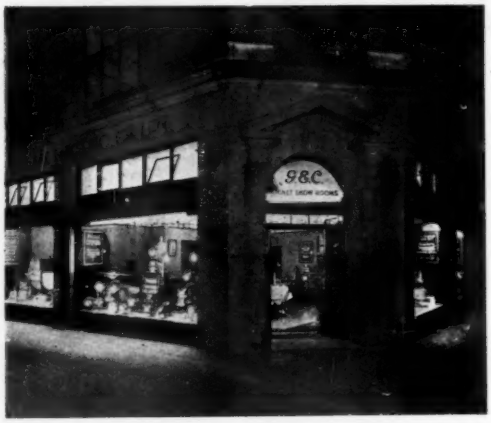


Fig. 1.—The New G.E.C. Showrooms.

The showroom is very well lighted, and it is heated by a number of "Magnet" fires of various designs. Among the smaller appliances shown is a new "Magnet" iron. The appearance of this has been greatly improved; the back rest has been strengthened; and a generous length of "unkinkable" flex is supplied.

From the ground floor to the basement is a glass staircase which is illuminated by lamps fitted beneath the treads; it leads to a "Tudor" room, which is designed and decorated so as to create an atmosphere which normally requires centuries to produce. Low ceilings, massive oak beams (or an excellent imitation), and spacious hearths, all contribute to this atmosphere.

From the Tudor room access is gained to the kitchen which forms part of the Magnet House "all-electric home." At the time of our visit clothes were being washed by a "Magnet" machine and dried by means of a "G.E.C." fan. We renewed our acquaintance with the garden outside the dining room which can be flooded with "sunlight" or "moonlight" as desired; the restful bedroom; and the extensive lighting fittings showroom. In the last the "Orchestrola" was demonstrated. The main feature of this is a giant loud speaker which with a suitably-treated input gives pleasing and ample results for a large hall. The demonstration was given by means of a "Gecophone" gramophone pick-up which is substituted for the sound box on the tone-arm of the machine, but the "Orchestrola" can also be employed for radio reproduction and speech amplification.

The cause of electrical education should be assisted to a very great extent by the General Electric Company's latest effort; the demonstrations must certainly make a pronounced impression upon the thousands of people who pass the premises daily.

It has been proved conclusively by the results obtained in all parts of the country that the only way to instil the electrical idea into the public mind is by actual demonstration.

It is one of the points in favour of electrical appliances that they are easily and conveniently operated in any surroundings. While they are also pleasing to look at, the principal questions which the public asks are: "What will they do?" and "How much do they cost?" The answer to the first question is provided by such demonstrations as are given at the new showrooms, and they will probably persuade people to enter the showrooms to ask the second question. Once inside, their conversion should be easy.

What the Public Wants to Know.

Writing in *Electrical Merchandising*, Mr. Frank B. Rae, Junr., states what the public wants to know in the following terms:—The old-time electrical trade used to tell itself and the world that to successfully sell electrical merchandise required a 'knowledge of electricity.' Just how much lukewarm hooey was in this assertion is indicated by the fact that to this day nobody knows what electricity is and almost nobody cares a damn. The public is interested solely in what electricity will do, and electricity applied through plug or socket to an electrical appliance will do as much for me or you as it will do for Edison or Sam Insull. Which being the case, knowledge required to sell the appliance is knowledge of what the public wants in the way of results and not particularly a knowledge of how such results are attained."

Fig. 2.—Interior of the Main Showroom.

Fig. 3.—A Corner of the Tudor Room.

Not a great deal of electrical apparatus is displayed here, but in the manner of the West End stores a few appliances have been arranged in a telling manner. The aim is to demonstrate the ease with which electricity can be introduced into any surroundings tastefully and harmoniously. Bronze lanterns and electric candles provide the illumination and in the hearths are fires of "period" design which look quite at home there. A corner of the room is illustrated in fig. 3.

Modern Oil Engines.

Messrs. Davey, Paxman & Co., Ltd., have developed a range of heavy-oil engines of the spring-injection type, which represent a considerable advance in the design of this class of equipment.

THE suggestion that the day of the oil engine is over must not be taken too seriously. While the advent of the national electricity supply schemes has undoubtedly affected the installation of the oil engine for public electricity supply, there appears to be a growing demand for this type of prime mover of the lower capacities, both in this country and abroad. This was an impression drawn from a visit to the works of Messrs. Davey, Paxman & Co., Ltd., who have always in the past concentrated on the steam engineering side, but who now see fit to give serious attention to the oil engine. The "Paxman" oil engine is of the vertical type, embodying the spring-injection method of fuel feed introduced by Messrs. Blackstone & Co., Ltd., a few years ago, and is made in 32 sizes, varying from a one-cylinder model of 25 b.h.p., 360 r.p.m., with a fuel consumption of 0.47 lb. per b.h.p. hour, to a 900-h.p., six-cylinder engine, 250 r.p.m., which is guaranteed to run at full load on a consumption of 0.40 lb. per b.h.p. Fig. 1 shows a 3-cylinder, 180-h.p. engine which runs at 300 r.p.m. and has a guaranteed fuel consumption equal to that of the largest size.

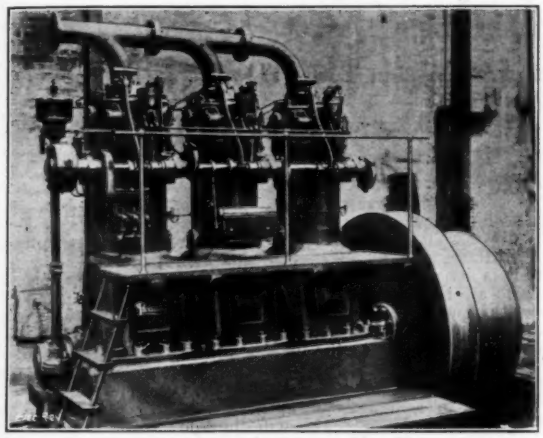


Fig. 1.—180-h.p. "Paxman" Oil Engine.

Simplicity of design seems to be the predominant feature of the apparatus; the results are certainly creditable. Some tests observed in the works on a 180-h.p. engine suggest that something near the smooth-running characteristics of the steam engine has been obtained. The set was started against about three-quarter load and picked up with steady firing after one revolution under compressed air. The "Paxman" starts on any cylinder. The speed of the engine was varied repeatedly between full speed and about 90 r.p.m., and the variation was gradual and steady the whole of the time.

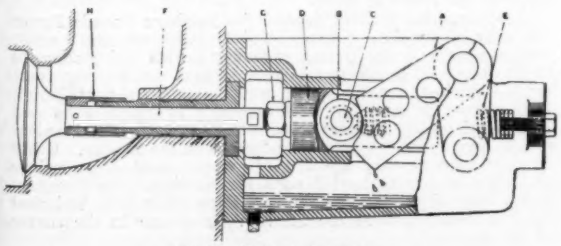


Fig. 2.—Exhaust Apparatus.

The main features of the engine are the spring-injection apparatus and the exhaust valve; the latter is a recent introduction of the company and results in considerable silencing effect. In place of the usual rotating cam and rocker arm, there is a rocking cam operated by an eccentric on the half-time shaft. This cam is devised on the Paxman-Lentz principle, whereby the valve is freed gently from its seat, opened with great rapidity, held open for a short space, rapidly lowered again, and then eased gently on to its seating.

Fig. 2 illustrates the construction and operation of the exhaust apparatus. The valve F is screwed into a cylindrical guide D and secured with the lock-nut G. D is slotted and carries a hardened steel roller B at its upper end; this is free to rotate on pin C which extends at either side of the guide through slots in the valve bonnet and grooved at its sides to take the hooks of the light springs E. The sleeve H protects the valve stem against the action of the hot gases. The valve is held down on its seat by the light springs, the tension on which is adjusted by tightening or slackening the end nuts. The cam A is screwed to the cross shaft and rocked up and down by an eccentric on the half-time shaft in such a manner that, on rising, it comes into gentle rolling contact with the roller B at or about its mid-stroke—the fastest part of its movement. The shape of the cam is such as to give the opening and closing characteristics already referred to.

The valve can be detached from the guide by slackening the lock-nut and unscrewing by means of the flats on the valve stem. The guide can then be withdrawn into the bonnet, leaving the valve free for grinding. The valve stem is supported in dead centre by the guide which is long, of large diameter, and automatically lubricated.

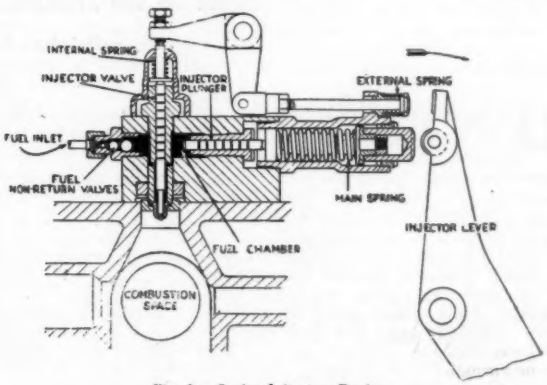


Fig. 3.—Spring-Injection Equipment.

We have already described the "Blackstone" spring-injection apparatus (ELECTRICAL REVIEW, August 14th, 1925, p. 274), but its application to the vertical engine has necessitated certain modifications, and it may be as well to outline the principle again. A measured quantity of fuel is delivered by a governed pump, at a pressure not exceeding 10-15 lb. per sq. in., to a chamber on the cylinder head, where it is imprisoned and only subjected to pressure just prior to injection. This takes place at approximately 1,000 lb. per sq. in. The oil suddenly escapes past the injection valve at full pressure, enters the combustion chamber in a steady jet, and is then as suddenly cut off. The effect is to obviate the dribble at start and finish that seems to be unavoidable with cam injection. Fig. 3 shows the details of the apparatus; the injector lever is in the off position

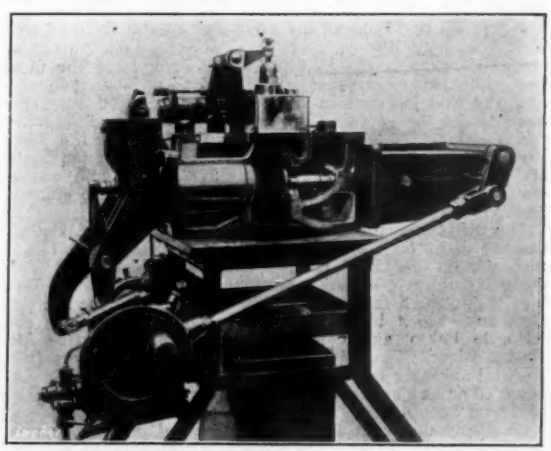


Fig. 4.—Cylinder Head, Section.

and a measured quantity of fuel has been delivered to the fuel chamber, pushing the injector plunger and the main-spring member bodily outwards. Rotation of the half-time shaft brings the roller on the injection lever into contact with the outer portion of the main-spring member, compressing the spring and forcing the injector plunger against the oil in the fuel chamber and closing the non-return valves. The injector valve is held on its seat by the combined action of the internal and external springs. Further movement of the injector lever compresses the external spring, slightly taking its pressure off the injector valve. The oil pressure is then sufficient to lift the fuel valve off its seat for injection.

The air valve is carried complete in a detachable box, which is instantly removable by unscrewing four nuts. Each combustion chamber is fitted with a relief valve to care for any abnormal pressures which may develop.

Fig. 4 shows a section through the cylinder head.

Each cylinder is provided with its own fuel pump. The pumps are eccentric controlled and operate at half the engine speed. Full atomisation of the fuel is provided, independent of the engine speed, so that the engine fires regularly and delivers the full torque at the lowest speeds. The governor is of the centrifugal spring-loaded enclosed type. It is very sensitive in operation and is claimed to be free from hunting.

The main and camshaft bearings are ring oiled, while the other bearings are supplied with forced lubrication.

The cylinders and cylinder heads are provided with the usual water-cooling arrangements.

The Empire Mining Congress and the Electrical Industry.

Notes on the Meeting and the Canadian Tour.

(By a Delegate from Great Britain.)

(*Concluded from page* 650.)

ON September 12th the delegates visited the huge smelter at Trail. The electrolytic zinc refinery here played a most important part during the war. The processes have since improved to the point when practically chemically pure metal is turned out. The plant is waiting for the provision of the power supply from Lower Bonnington Falls in order to proceed with the production of high-grade steel by electric smelting from zinc-plant residues rich in iron oxide.

Power comes at present from the 60,000-h.p. plant of the West Kootenay Power and Light Co., Ltd., at Upper Bonnington Falls, thirty miles distant, being transmitted along two 60,000-volt and two 20,000-volt lines to a control substation, where it is stepped down to 2,200 volts and distributed to departmental sub-stations. The total requirements of the Trail works now reach 66,000 h.p. Water for the plant is delivered by flumes from creeks in the vicinity, augmented by a further supply pumped from the Columbia River by three 1,500-gallon pumps, each driven by a 200-h.p. motor and delivering against a head of 315 ft. The plant employs 2,500 men, and produces 400 tons of lead, 280 tons of zinc, 60 tons of copper, and 20,000 oz. of silver a day, in addition to 2,500 oz. of gold per month. The lead refinery has the distinction of being the first plant to use the Betts process for the electrolytic purification of lead—this process having been developed from the laboratory to the commercial stage at the Trail plant. The power needs of this section of the plant are more than 2,800 kW. In the copper refinery the usual electrolytic refining practice is followed, the plant using 400 kW.

The trains left Tadanac the same day by the scenic Kettle Valley Railway line *en route* for Princeton and the copper mountain mines of the Allenby Copper Company. The mine has estimated reserves of 8,000,000 tons of low-grade ore, and the mill has now a daily capacity of 2,000 tons, the concentrates being railed to the Trail smelter at Tadanac for smelting. Power is taken from the plant of the West Kootenay Power and Light Co., Ltd., at Bonnington Falls, and both transportation and lighting in the mine and concentrator are electrical. The Congress party left Princeton on September 13th for Vancouver and Victoria.

The Britannia mine and concentrator on Howe Sound, another thoroughly up-to-date electrically operated plant, was inspected on the 15th. Some of the energy is obtained from streams on the company's property and, in addition, 6,000 h.p. is purchased from the British Columbia Electric Railway Company—which has important developments at Slave and Alonette Lakes, and new plant under construction on the Bridge River. The additional power is brought direct from North Vancouver to Britannia Beach by a transmission line about 30 miles long, built for the most part along the shoreline of Howe Sound.

On September 17th the Congress trained eastward on its return journey. After a day spent in examining the collieries at Sterco and Coal Valley, and at Cadomin, the party left for Wainwright. In the Cadomin mines electric lighting is supplied from batteries.

On the return journey to Winnipeg delegates were afforded an opportunity of seeing the city hydro station, where there is a steam-turbine standby plant capable of producing 21,000 h.p. from three Parsons generators. The boilers are fired by pulverised fuel on the Lopulco system. The plant also contains two electric boilers utilising each 1,500 h.p., served by the off-peak power from the hydro-electric system, and supplying steam to the city's central-heating system. The writer had an opportunity of visiting the pulp and paper plant of the Provincial Paper Mills, Ltd., which is, of course, like most similar works in Canada, electrically operated throughout.

The Noranda Mines and Smelter, which were visited on the following Sunday morning, are supplied with electric power by the same corporation which serves the neighbouring mines in Northern Ontario. Tramming underground in the Noranda mine is done with three-ton Atlas storage-battery locomotives, which are short enough to go on the mine cage; and similar machines will be utilised to haul the ore cars from the shaft to the primary crusher. A double-drum electrically driven hoist, manufactured by the Canadian Ingersoll-Rand Company, is used for hoisting the ore cars; it has a lifting capacity of 12,000 lb., and a hoisting speed of 750 ft. per minute. Two forty-ton electric cranes for the convertor aisle are to be used in the sample room, and one ten-ton electric crane in the dispatching room. Electric trolley locomotives arranged for storage-battery operation, if required, are used for hauling the slag.

In the Cottrell Plant electric precipitation is used to prevent the ore dust from passing out through the stack, the system used being a series of curtains made up of small rods or wires and small pipes, between which charges of electricity at from 40,000 to 75,000 volts are passed. The particles of dust clinging to the pipes are knocked away at regular intervals. Two 20,000 cu. ft., 20-lb. Ingersoll-Rand blowers for the convertors are directly connected to 1,300-h.p. General Electric synchronous motors; two motor-generator sets, manufactured by the English Electric Co., Ltd., 575-h.p. induction motor, 60-kW, 125-volt generator, are installed for plant control service, and 430-kW, 250-volt generator for crane and electric locomotive service. An emergency storage battery will automatically turn the convertors so that copper cannot fill the tuyères if the power goes off suddenly. Electric furnaces are available in the laboratory for assay work, there being also ample material for research work.

Power from the Quinze plant of the Northern Canada Power Company is brought a distance of sixty miles, at 110,000 volts, and reduced in the power company's own sub-station to 12,000 volts. This sub-station is used as a distributing point for the smelter, the town site, and the surrounding district. The current is taken by the company at 12,000 volts and distributed to six separate transformer stations at convenient points, and reduced to 550 volts for use in the motors. Other lighting transformers are located, where needed, to reduce the 550-volt current to 110 volts for lighting. The Congress trains reached Quebec on Monday, September 26th, technical sessions being held at the Chateau Frontenac in the course of the day.

Passing on from Quebec at midnight over the mighty Quebec Bridge, we found ourselves at breakfast time at Thetford Mines, in the heart of the asbestos country, where parties visited the mines and mills of the Asbestos Corporation of Canada, Ltd. Power for the various plants is brought, in part, at any rate, from the far-away Shawinigan Falls on the St. Maurice River, the transmission lines being carried across the St. Lawrence River. Passing through Sherbrooke during the afternoon, we had opportunity to notice the considerable industrial development of this metropolis of the Eastern Townships of Quebec. The city itself owns six hydro-electric power stations, with a total capacity of 25,000 h.p., and, in addition, the Southern Canada Power Company (itself linked up with a larger organisation—the Power Corporation of Canada) operating in the city has a developed capacity of 15,500 h.p. For a ten-hour service power is supplied on a kW basis, the present average charge being about three-quarters of a cent per hour per kW installed. For a 24-hour service a flat rate of $16.00 per h.p. per year is charged. I was told that the price charged at Winnipeg for a somewhat similar

service was as low as one-half of a cent, but was unable to confirm this.

After the arrival of the Congress trains at Montreal on September 27th, tour "A" came to an end, but the writer commenced an independent tour, embracing another short visit to the Ottawa district, where immense electrical developments are in progress, followed by trips to the great Saguenay River power stations and the Sydney (N.S.) steel and coal-mining industries. Apart from the small plants which serve the city itself from the Chaudière falls on the Ottawa River above the Parliament Buildings—which, by the way, during my visit broke down for a few minutes for the first time in fifteen years, leaving in darkness a vast crowd listening to the glorious music of the Parliament Buildings carillon—the Ottawa River Valley is the scene of enormous developments of quite recent date. The Gatineau Power Company, a subsidiary of the Canadian International Paper Company, is engaged on electrical developments on the Quebec side, which, when completed, will entitle it to rank as one of the largest power-producing and distributing organisations on the North American Continent. The company owns water-power sites with an aggregate potential capacity of over 700,000 h.p. on the Ottawa River and its tributaries. The developments on the Gatineau River include the hydro-electric plants at Farmers, Chelsea, and Paugan, the two first-named of which I was able to visit, in addition to the enormous mill of the Canadian International Paper Company at West Templeton, Quebec. The company also operates a hydro-electric plant at Temiskaming on Gordon Creek, about 230 miles north of Ottawa. Important contracts have already been made for long-term supply to the Ontario Hydro-Electric Power Commission for use as far west as Toronto, and other concerns.

The Chelsea plant is designed for an ultimate installation of five units of 34 000 h.p. each, and will operate under a head of 96 feet, the height of the power house being 160 feet. The dam is 1,600 feet long and 100 feet in height, and will back the river up a distance of twenty-six miles to the tailrace at Paugan Falls, impounding about 440,000,000 cubic feet of water.

The Farmers hydro-electric development is 7,000 feet downstream from Chelsea, and will back the water up to the tailrace at Chelsea. The power-house is designed for five units of 24,000 h.p. each, and will operate under a head of 66 feet. The length of the dam at Farmers, including spillway, power-house sections, and wingdams, is 4,800 feet, and its maximum height is 75 feet. This plant will work in parallel with that at Chelsea, power being generated at 6,600 V and stepped up to 110,000 V for transmission.

The Paugan development is 26 miles above Chelsea. The dam is being built below the falls, and will back the river up a distance of thirty miles, submerging nine falls and rapids and creating a head of 136 feet. The power house is designed for eight units of 34,000 h.p. each. The power will be generated at 6 600 V and stepped up to 220,000 volts for transmission. By combining the operation of the Chelsea, Farmers and Paugan developments into one system, it will be possible to utilise to the best advantage the total fall of the river for a distance of sixty-two miles. The storage provided by the lakes created by the Chelsea and Paugan dams will assist materially in the regulation of the system, and should eliminate all possibility of trouble from ice.

Under the direction of the Quebec Streams Commission the company is building a large concrete dam on the Gatineau River about thirty miles above Maniwaki. The reservoir formed by this dam will have an estimated storage capacity of 95,000,000,000 cu. ft. It will be the third large artificial storage reservoir in the world.

The present installation will consist of four units each at Chelsea, Farmers, and Temiskaming, and six at Paugan, or a total of 475,000 h.p., including the 16,000 h.p. in other developments on the Rouge River, North River, and Ouareau River. This original installation will generate from the end of 1928 approximately 2,150,000,000 kWh per annum, which is 70 per cent. of the output of the Ontario Hydro-Electric Power Commission, Canada's largest power supply concern.

The industrial developments now taking place in the Lake St. John and Saguenay River area, due to the presence there of vast, and hitherto unexploited, water-powers, are of peculiar interest, and have attracted considerable attention. It is, moreover, reported that great investments of British capital are likely to be made there in railway and paper-mill construction during the next few years. There is a prosperous agricultural population already established, and it is not unlikely that minerals may be discovered and exploited in the neighbourhood. Some 60,000 tons of wood-pulp is already exported annually to Great Britain from the port of Chicoutimi.

The River Saguenay has a drop of 300 feet between Lake St. John and tidewater at Chicoutimi. Into a channel, or group of channels, flow the waters of a great area, 35 000 square miles, tributary to the lake itself, which is a collecting basin of 375 square miles. Some 12 power plants are either completed, under construction or contemplated, making a total capacity of 1,450,000 h.p. The Aluminium Company of Canada has an important plant at Isle Maligne, on the Great Discharge of the Saguenay, from which power is supplied to the Shawinigan Water and Power Company and other important concerns, including the great aluminium plant at Arvida. The aluminium plant and its accessories is to be the world's largest producer, and will cost in the neighbourhood of $100,000,000, bauxite being brought up the Saguenay from British Guiana in tramp steamers, which will return to the ocean loaded with cargoes of pulp and paper for foreign markets. The present output is a million tons of pig weekly; dried bauxite from the American plants at St. Louis, Mo., is being used until plant is ready to handle from next January onwards the stocks of bauxite now coming up the river from British Guiana. The plant produces its own electrodes, from petroleum coke, which is crushed, pulverised and moulded with pitch binder on the premises. The reduction of the dried bauxite is done in large brick-lined iron tanks covered with powdered carbon, prior to the introduction of the concentrate, which is subjected to an electrical discharge at 6 volts, the aluminium being poured off at intervals into moulds. Power for the great plant comes in from Isle Maligne at 154,000 V a.c., and is stepped down to 13,000 V and 440 V a.c., and regenerated at 600 V d.c. for use in the plant. I saw one cut-out stated to be the largest in the world, and having a capacity of 37,000 A.

The construction of the great Isle Maligne plant is worthy of an article to itself, as it is one of the greatest triumphs of engineering genius and persistence. Suffice it to say, however, that the plant has an ultimate capacity of 540,000 h.p., and ten of its twelve 45,000-h.p. generating units are now installed. These will, however, be reduced to insignificance by the ten turbines of 80,000 h.p. each which the company intends to install in the proposed Chute a' Caron works on the opposite bank of the river, facing the city of Arvida. When these mighty engines are set going production at the aluminium plant will reach about 180,000 tons per annum, or 90 per cent. of the world's present consumption of the metal.

Spillways for the Isle Maligne plant are provided at the Little Discharge from Lake St. John, and there are four more on the Isle Maligne, past which used to flow the two channels of the Great Discharge, now reduced by this mighty engineering work from a pair of raging impassable torrents to a maid-of-all-work for all these plants which, in the space of four or five years only, have turned a wilderness into a hive of industry, particularly since the power house started actual operation in April, 1925. The plant has a head of water of 110 feet, and another 220 feet will be available at Chute a' Caron.

Following my visit to Isle Maligne, I made a trip to Shawinigan Falls and Grand'Mère to see the hydro-electric power developments, aluminium wire and cable works, calcium carbide factory, and paper mills in that district.

Some of the plant which I saw at Shawinigan Falls is not comparable in efficiency with what the company is using in other units of its vast organisation. Electricity is produced and distributed on both sides of the St. Lawrence River, and the company has a high-pressure transmission line which crosses the river near Three Rivers. This overhead crossing is one of the largest in existence, both as regards the length of span, 4,800 feet, and the height of towers, 375 feet above foundations. With the anchor spans on the shores, the total length of the crossing is 6,324 feet, and the minimum clearance above the water is 165 feet. One hundred and sixty-five municipalities are served by the company, including the cities of Montreal, Quebec, and Three Rivers, the Montreal Light, Heat and Power Consolidated purchasing no less than 100,000 h.p. to supplement its own output of electricity. The pulp and paper industry in this part of the Province purchases 125,000 h.p., some of which is used for the production of process steam in a generator invented by the company's engineers. The asbestos mines which I visited in the Eastern townships south of the St. Lawrence take 20,000 h.p., and the various electric furnace industries in and around Shawinigan Falls take more than 130,000 h.p. The Aluminium Corporation, for instance, uses 50,000 h.p., and 30,000 h.p. is supplied to the Canada Carbide Company, which produces carbide of calcium from limestone and coke by the discharge of electricity in an arc furnace, liberating hydrogen which burns with an intensely white and hot flame.

One of the installations at Shawinigan Falls dates from 1902, and its capacity with the old machines still working is 58,500 h.p. Power House No. 2, however, added in 1910, has five 20,000-h.p. horizontal generators and one new 45,000-h.p. vertical unit added quite recently. Provision is made to bring the total output of this section up to 235,000 h.p.

At Grand'Mère, I visited the Laurestide Company's great paper mill. The power house contains six 20,000-h.p. and two 22,000-h.p. units with space for another 22,000-h.p. generator later. The Shawinigan Company utilises all except 37,500 h.p. of this power for transmission to consumers elsewhere on its system. The newest and greatest development on the St. Maurice River, that at La Gabelle, seven miles lower down the river, I had no time to see, but I understand that there are to be in operation there five 30,000-h.p. vertical units, four of which are already installed, making the total capacity of the three stations operating along thirteen miles of this river 507,500 horse-power. The regular supply of water is ensured by the construction by the Quebec Government in 1917 of the great Gouin Dam at La Lontre, 200 miles from the confluence of the St. Maurice with the St. Lawrence, which forms a lake with an area of 360 square miles.

Leaving Grand'Mère, I journeyed to Sydney, Nova Scotia, where I was able to inspect one of the submarine collieries of the Dominion Coal Company and the great steel plant of the Dominion Iron and Steel Company.

In the mine which I visited the coal hoist is of the bicylindro-conical drum type, operated by a 3-phase, 25-cycle, 1,325-h.p. induction motor, 3,200 volts, 375-364 r.p.m. Sixteen-ton Goodman electric locomotives are employed where gravity cannot be utilised. D.c. to the trolley system is supplied by a motor generator set inside the mine. Auxiliary hoists are both electric and air driven, and are so designed as to regenerate energy when dropping the loaded trips down to the main landings.

The pumping station is situated near the pit bottom and consists of two 1,250-g.p.m. Sulzer turbo pumps, direct connected to 400-h.p. slip-ring induction motors, 2,200 V, 25 cycle, 3-phase. Two-c.p. Edison electric battery lamps are supplied to all workmen. The electrically-operated picking belts at the bankhead are capable of handling 400 tons of coal per hour.

From the colliery I was motored to the great steel plant at Sydney, where I inspected the six blast furnaces to which high-grade Wabana ore from Bell Island, Newfoundland, is taken from the shipping pier hard by on Sydney Harbour in cars hauled by electric locomotives. Ingots are transported to the rollers by electric buggies, into which they are loaded by telescopic overhead cranes. The blooming mill is driven by a large steam engine of 7,200 horse-power, the exhaust steam of which is used for generating electricity in a 7,600-kW power house close by. In the billet mill farther on an electric motor of 10,000 h.p., stated to be the largest in Canada, is installed. In the rail mill power for rolling is supplied by a 7,500-h.p. motor.

My Canadian tour reached its conclusion at Halifax. A trip of this kind, although occupying six weeks of almost constant travelling, cannot do more than give one a bird's-eye view of the prominence of electricity in the economic development of Canada which leads the world in the *per capita* generation of electricity. Canadian water-powers have an available capacity of 18,000,000 h.p. at ordinary minimum flow, or 32,000,000 h.p. dependable for six months, with a possible turbine installation of 47,000,000 h.p., only a tenth of which is now in place. In Ontario and Quebec, where coal has not yet been found, water power is abundant and electricity cheap, and, as we have seen above, the habit of employing electricity in industry of every description is prevalent.

So important a part does electricity now play in the industrial life of the Dominion that the Royal Bank of Canada now regularly publishes monthly statistics of power generation as an index to general industrial activity covering no less than 92 per cent. of the country's industry. At the end of 1926 the number of kWh generated daily by central electric stations throughout Canada was more than 30,000,000.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this Section.

An "All-Insulated" Switch.

We have received from Messrs. J. H. TUCKER & CO., LTD., King's Road, Tyseley, Birmingham, a sample "All Brown" switch which they have recently put on sale. It is an ordinary tumbler lighting switch, embodying the usual movement of the makers, except that all the exposed parts are of insulating material in chocolate brown, giving the device a distinctive appearance. The base appears to be of a brown porcelain, or similar material, and is finished with a particularly hard surface. The cover is of bakelite or similar moulded material, and is claimed to be unbreakable, damp- and fireproof. The dolly is also of insulating material, but is reinforced by a tapped metal portion which extends well into the head, giving the part ample strength. A similar switch, but "All White," has also been introduced by the makers.

Small Battery-charging Sets.

A line of battery-charging sets has recently been placed on the market by Messrs. HIGGS MOTORS, of Witton, Birmingham, notable for compactness of design and economy in first cost. The dynamo has an output of 17 A at 12-15 V, and weighs 42 lb.; a shunt regulator and an ammeter are mounted

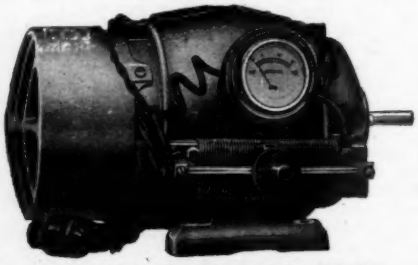


Fig. 1.—Rotary Transformer, 9 A at 12-15 V.

on the machine. Fig. 1 shows a 9-A rotary transformer, d.c. to d.c., with regulator and ammeter, and fig. 2 a motor-generator, a.c. to d.c., giving 16 A d.c. on a 50-cycle a.c. circuit. The machines have been designed for continuous service, and are built of standard components, with ball bear-

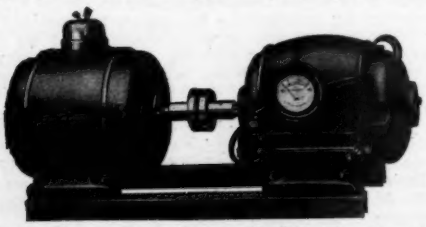


Fig. 2.—Motor-generator, 16 A at 12-15 V (50-cycle supply).

ings; they carry a two-year guarantee, and comply with the B.E.S.A. specification No. 168/1925. A battery cut-out is made for use with the sets.

A New Ceiling Rose.

Messrs. REEVERS, 3, Bridewell Street, Bristol, have recently introduced a new type of ceiling rose which, it is claimed, possesses many advantages over the standard pattern. It can be used as an ordinary drop point or as a connecting link between the cable and drop pendant, instead of using connectors. It is possible to get at the wiring by just taking off the cover and not removing the block. The "Reeverlite" is claimed to be the only rose available with a cover of bakelite, if desired. This gives a very neat and attractive appearance. The covers are also supplied in china or insulated metal.

The New Pattern Portable "Dionic" Water Tester.

Since the "Dionic" tester was invented 20 years ago, many useful applications have been found for it, especially that of detecting condenser leakage, and the makers, Messrs. EVERSHED & VIGNOLES, LTD., of Acton Lane Works, London, W.4, have found it worth while to develop an improved pattern, which is illustrated in fig. 3. The principle employed is the same, but the apparatus has been simplified and its utility increased.

The "Dionic" water tester consists of two parts, the water-tube section and the conductivity meter. The new form of water tube is much more compact than that which it supersedes; it can be mounted permanently on a panel, placed

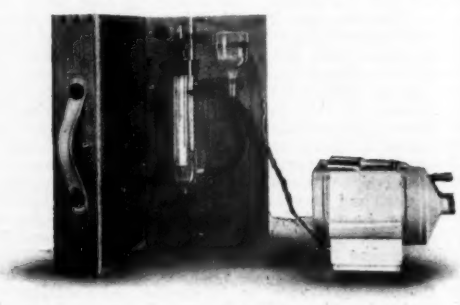


Fig. 3.—The New Portable "Dionic" Water Tester.

on a bench, or suspended in a vat or tank. Since the conductivity of all solutions varies very greatly with the temperature, correction must be made for these variations, either by means of a table or by some form of compensation; the temperature compensation in the new form of indicating "Dionic" water tester involves no calculations, and the operation can be carried out very easily in a few seconds. The new form of water tube can be entirely dismantled for cleaning or for the replacement of any part without affecting the calibration.

Improvements have also been made with regard to the conductivity meter. Two forms are now available, one resembling the well-known "MEG" insulation tester, with

a range of 0-5,000 units (1 unit=1 reciprocal megohm per centimetre cube of liquid), and another form resembling the "Megger" testing set, which provides for the first time two or three ranges and has the advantage that the same instrument can be used to test both relatively pure water such as boiler condensate, and impure water such as ordinary boiler feed, and yet provide equal accuracy in both tests.

Information has been collected regarding the actual use of the "Dionic" water tester, and a new pamphlet (116g) has been drawn up including as much as possible of this information. The section "Practical Uses" takes up more than half of the new edition. The number of the new "Dionic" Catalogue is D.116.

A Chemical Pole Finder.

A recent introduction of Messrs. RUNBAKEN MAGNETO Co., Tipping Street, Ardwick, Manchester, a chemical pole finder for use on all pressures up to 250 V, is an advance on the magnetic type of finder, which requires special windings for various voltages. The device, fig. 4, consists simply of a

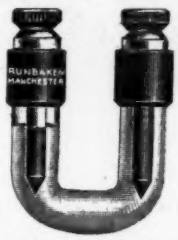


Fig. 4.—The "Runbaken" Chemical Pole Finder.

short "U" tube containing a special chemical in which are partly immersed the necessary electrodes, these being attached to convenient terminals at the ends of the tube, where insulating collars are fixed. When used on d.c. circuits the liquid in one side of the tube becomes red and denotes the negative pole. Red at both sides indicates an a.c. supply.

New Electric Fires.

A range of electric fires has recently been placed on the market by the FURNACE ELECTRIC Co., St. George's Hall, Bradford, embodying a number of new features both in technical design and general appearance. A bowl fire is fitted with a reflector of special light hammering, which gives the pleasing effect of a hammered reflector without the dis-

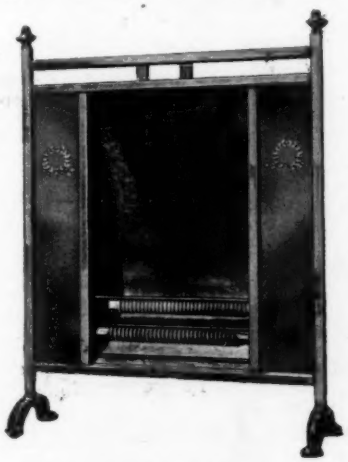


Fig. 5.—The "Furnace" Screen Fire.

advantage of splitting up the heat rays. It is fitted with a cone-shaped element instantly detachable from the front. Connections are made by means of bolts straight through to the back, and no mica washers or other small insulating pieces are used. The fire tilts into the vertical projecting position for warming food. A reflector fire included in the range is elegantly finished and is fitted with a "Furnace" patent fire bar. The latter is held by a spring, which presses home a taper contact at the far end of the bar. There is no wiring whatever in this apparatus; the connections are bolted straight through to the outside. The fire is open like a grate and fitted with fire bars, thus throwing plenty of heat downwards. A novel and interesting item is a screen fire, fig. 5, which is made with 2- and 3-kW loadings. It is fitted with a copper reflector and the standard "Furnace" elements. The 3-kW model will, it is claimed, efficiently heat a room 20 ft. long by 17 ft. wide by 9 ft. high. When not required as a fire, the whole of the reflector and elements may be covered by an ornamented sliding panel, and the appliance then becomes an elegant piece of furniture.

Hire Purchase.

Its Advantages and Pitfalls.

AT a luncheon held at the Holborn Restaurant on October 27th, under the auspices of the Household Appliances Section of the London Chamber of Commerce, Mr. W. H. Webbe, C.B.E., delivered an address on "Hire Purchase." In introducing the speaker, the chairman (Mr. G. E. W. Crowe) said that he looked upon the hire-purchase system as a form of compulsory saving. Very few people would pay a servant a year's wages in advance, and he thought that the monthly payment for an appliance which did away with the need for a servant was justifiable.

Mr. WEBBE commenced his address by stating that if there was a public demand for the hire-purchase system it was the duty of the trader to meet it: he should not encourage extravagant schemes, however. American experience showed that the system was a powerful stimulant to trade, for any form of credit must lead to an increase of purchases. In the United States the tremendous development of the automobile industry was almost solely due to the hire-purchase methods instituted. Instalment sales of mechanical refrigerators had increased by 400 per cent. in two years. The system was applied to a wide range of goods; 75 per cent. of the washing machines and 65 per cent. of the vacuum cleaners were disposed of by deferred payments. Not only did the system stimulate business, the effects were lasting and cumulative. Increased production reduced the selling costs and widened the field of cash sales. There were, however, certain dangers. The first was over-production and resultant saturation of the market: that stage was said to be approaching in the United States motor industry, but it was not within sight in the sale of household appliances. The danger was a very remote one. The system introduced a new and very effective weapon of competition; there was a temptation to offer too-attractive terms which were bad for the industry and those engaged in it. There was also the danger of competition between goods of a different character. Easy terms, coupled with high-pressure salesmanship, led people to buy things which were unnecessary luxuries which was not in the interests of the trade in the long run; customers should buy in accordance with their needs and their means. It was a good thing for people to be able to enjoy the amenities of life while they were still young, and every man and woman should be able to command a certain amount of personal credit. The method was in some respects more definite and safer than open credit. Only productive articles should be sold on deferred terms, but the word "productive" should not be too rigidly defined; even a piano was in a sense productive if it provided healthy amusement and kept people at home. The term of payment should never be longer than the life of the goods. Dealers employing the system should educate their customers on the right lines, not allowing them to take things which they did not need or could not afford. Customers should pay a good deposit and not be allowed too long in which to pay for the goods. Although it seemed that a nation deeply involved in hire-purchase would be badly hit by disaster or depression, so far the facts had not confirmed this. To illustrate his point, Mr. Webbe quoted the Pennsylvania miners' strike, which appeared to have had little effect upon the hire-purchase concerns. Although the system had been described as "mortgaging the future for present prosperity," in the United States, while hire-purchase had grown by leaps and bounds, savings, insurances, and building-society deposits had also increased in substantial proportions. An impartial American economic body, after a thorough investigation, had arrived at the conclusion that the hire-purchase system formed a very useful factor in the country's economic organisation.

A brief discussion followed, in which Mr. B. Y. JACKSON (sales manager, Frigidaire, Ltd.) quoted figures relating to the General Motors Corporation, which, he said, was one of the largest organisations in the world so far as hire-purchase was concerned. Their current business on the system was valued at about £50,000,000, and altogether their losses were less than one-third of 1 per cent. The business was growing rapidly in this country, and well-to-do people availed themselves of the facilities. So far they had had to re-possess themselves of only five of their refrigerators. They always insisted upon a deposit of not less than 10 per cent., and the period of repayment was never longer than 18 months.

Mr. STAPLEY said that they wanted the small retailer to realise the benefits of the system in the way of increased turnover and negligible loss. A great deal of the business turned into cash sales, and the system also provided a method of approval before final acceptance by the purchaser.

Mr. BRYAN considered that the term "hire purchase" was a bad one, and that some such description as "extended payment system" was to be preferred.

The proceedings closed with a vote of thanks to the speaker, proposed by Mr. Bangert.

Psychology in Engineering Progress.

The importance of the Study of the Mental Characteristics of Mankind in the Service of Technicians.

By W. WILSON, M.Sc., B.E., M.I.E.E.

(*Abstract of Chairman's Inaugural Address at the* SOUTH-MIDLAND CENTRE *of the* INSTITUTION OF ELECTRICAL ENGINEERS.)

SUCH a subject may interest commercial engineers, whose dealings are primarily with human beings, but that it should also matter to those concerned with the design of electrical apparatus may need explanation. I am convinced that psychology has a more intimate bearing on design than is generally realised in this country, and that the recognition of this fact would be to the advantage of our industry.

One aspect of the first World Power Conference and the wealth of technical matter presented at Wembley has particularly impressed me as being worthy of cultivation in the present state of British industry; it is that the psychological aspect of the Conference was productive of more useful lessons to insular designers than the purely technical questions when considered solely in themselves. The Conference was a unique achievement, unusual in its scope, but the feature that gave it special significance was the fact that the wide syllabus was dealt with by so great a variety of men—men of widely different tastes and education, living and working under widely different conditions, and in widely different environments. Even if we were not concerned with the peoples themselves, the different solutions found for the various problems, and the means for coping with the unusual conditions encountered abroad, should still be of direct value to us; but, as an exporting nation, we *are* vitally concerned with the engineers of other countries for whom we desire to design and manufacture electrical equipment, and we have failed in the past to find adequate markets solely because we lacked the knowledge of our prospective customers. Whereas any particular Continental nation always includes a considerable section, mostly living upon its frontiers, which is brought into intimate contact with people of different races, beside whom they have to exist and with whom they have to transact business, island dwellers often scarcely realise that another point of view than their own exists.

That this disability has been operating in our own case is only too evident to those who have visited our distant customers, and many instances of the loss of valuable business due to this cause have been given in the past, without receiving any great degree of attention; no consideration that can hamper our overseas trade must be neglected. Authentic examples of the loss of business from the cause described, within my own experience, in each case called for a straightforward modification in design which would not have involved any appreciable complication, or additional expense, but was refused owing to sheer inability to understand the purchaser's point of view. It is evident that the tendency is a disastrous one, and it is worth while analysing the reason for it: there is no doubt that it is to be found in a wrong appreciation of the weight, common-sense, authoritativeness, qualifications, or (to put it in a nutshell) the psychology of "the man at the other end." Judged through the medium of the written word, he has in each case been considered to be making frivolous demands, and his representations have been disregarded. Such mistakes will continue to be made until the cause has been removed, and there is hence the strongest reason why every opportunity should be taken of becoming acquainted with those with whom we hope to have dealings abroad.

In contrast with the older policy, it is pleasing to dwell upon the recent change that has taken place in our attitude and, in particular, upon the work of delegations which have been making the acquaintance of people overseas and been actually going into very intimate contact with local conditions. With such methods of securing data for design, we can look forward to the future with confidence.

It is natural for a manufacturer to feel himself superior to most purchasers as regards familiarity with the design and construction of the product, and he may be pardoned for feeling that he can advise the client as to the qualities of the product; but in dealing with some purchasing engineers he will be able to receive a considerable amount of information, which is especially valuable as it represents the user's point of view. The decision when to instruct and when to learn is the vital point in negotiations, and can only be made in the case of distant correspondents with the aid of a knowledge of their psychology.

It will therefore be appreciated why I consider the World Power Conference of 1924 was a unique opportunity of gleaning information vital to our success as a manufacturing nation; we were able to study at close quarters, and in comparison with one another, typical and eminent representatives of our fellow engineers from all over the globe; whatever may have been the case in the past, it is a risky course to look upon any foreign engineer's opinion as of minor importance unless we have definite information to the contrary.

Moreover, the standard of technical attainment and of organising ability in our Overseas Dominions is of a high order; to-day they form our best markets, and their psychology is broadly that of ourselves, so that it should be possible for us to derive profitable information from schemes which they have built up to suit their own conditions.

Finally, undoubtedly some factor renders it easier for many overseas countries than for ourselves to adopt such obviously beneficial developments as the organisation of power supply, the application of electricity to the farming industry, and the like. In one instance after another it was evident that other countries had for years been practising improvements of the most valuable nature that were still either unknown here, or were being described as impracticable by our spokesmen. The reason cannot be the existence of more favourable conditions abroad, for in many cases the countries concerned were small and distinctly lacking in important natural and technical facilities which we enjoy. It would hence seem that the study of our own psychology may be instrumental in directly accelerating our own rate of progress.

In my opinion this disability is due not as is commonly supposed to an inborn conservatism, but to a habit of mind engendered by the exaggerated party system of government to which we are made accustomed at every turn. The practice of forming one's conclusions first and then selecting arguments to support them, especially that of opposing the efforts and proposals of others as a matter of course without examining the circumstances from every rational point of view, may possibly give good results in national or local politics; but once we have become familiar with these tactics in the one field, they will inevitably be applied in others unless effective precautions be taken to the contrary; whatever may be the justification for them in the process of government, their effect is disastrous in industry, especially engineering. The result of such a habit of mind is that when a proposal is made of a sufficient novel or far-reaching nature, almost the whole of those likely to be affected form themselves automatically into an opposition party and unite in decrying the proposal and its author. In order, therefore, that an innovator may secure the adoption of his idea, he must possess not only the valuable qualities that enable him to arrive at the original conception, but, in addition, a further set of qualities to enable him to withstand and overcome the totally unnecessary opposition to which he will be subjected. The disquieting thought obtrudes itself that the latter characteristics, which must include a tough hide, unbounded self-confidence, persistence, and probably also robust health, may not be possessed by more than one in ten of our inventors, with the result that 90 per cent. of the proposals that should make our industries flourish may be more or less wantonly slaughtered. A study of history will strengthen this fear, and it is therefore most necessary that this retarding influence should be recognised and borne in mind. Our industry urgently needs every improvement in methods and organisation, every gain in efficiency, and every opportunity of advancement that can be thought out; but for unmerited discouragement, far greater progress would be achieved.

A Strenuous Motor Trial.

From time to time instances come to light of the remarkable recuperative powers of the insulation of electric motors which have been submerged for considerable periods, the insulation being completely restored merely by the passage of current through the windings. A particularly interesting case is that of a motor which was subjected to complete immersion in pit water in a coal mine for eleven days, completely dried out without being brought to the surface, and put back into service. The motor is a 450-h.p., 4-pole, slip-ring, induction machine of the protected type, manufactured by the British Thomson-Houston Co., Ltd., and drives a centrifugal pump. It is wound for 6,000 V, 40 cycles, three-phase. During its immersion so much grease, coal dust and mud was deposited that it was found necessary first to dismantle the motor in order to clear the coils, slots and internal framework before commencing drying-out, which was effected by re-assembling the motor, short-circuiting the rotor, and passing a current of 22 A through the stator winding. This drying-out occupied 10 days, the current being "on" during an eight-hour shift in every 24 hours. Insulation tests were taken during each shift, when a temperature of 160 deg. F. was registered in the windings. At the end of the drying-out period the insulation tests for complete rotor to earth, complete stator to earth, and between phases all showed 100 megohms or more.

Marking Imported Electrical Porcelain.

Merchandise Marks Act Inquiry.

THE application by the National Council of the Pottery Industry, under the Merchandise Marks Act, for an Order in Council requiring that imported pottery should bear an indication of origin, was further considered on October 26th, by the Standing Committee appointed by the Board of Trade, consisting of Sir Hubert Llewellyn Smith (chairman), Mr. F. R. Davenport, and Mr. G. N. Barnes. The Porcelain Electrical Fittings Association is the constituent body of the National Council concerned with the electrical part of the case, which is opposed by the Electrical Importers' and Traders' Association.

Mr. BERTRAM CLIFFORD (commercial manager of Messrs. Bullers, Ltd.) gave evidence in support of the application, stating that consumers were unable to distinguish between British and foreign products. A considerable quantity of electrical porcelain was coming in from abroad, particularly from Germany and Czecho-Slovakia. His firm and, he believed, practically all firms in the English porcelain electrical trade, marked their ware with an indication of origin, except where customers asked for the mark to be omitted, or articles were too small to be marked. It was not always possible to mark electrical fittings under the glaze, but the mark could be applied equally efficiently and indelibly in other ways. The members of the Porcelain Electrical Fittings Association were responsible for about 95 per cent. of the British output.

The CHAIRMAN asked what was the present annual British output. The Board of Trade returns showed that the value in 1924 was £754,000. Witness said that it had increased since then.

Dealing with a statement that the Continent produced a type of article which was not readily obtainable in this country, witness said that British manufacturers made all types of electrical ware. He denied entirely a suggestion that the Association had forced up the prices of products to a point at which it was uneconomical for many manufacturers to use them. The Association was not concerned with the prices of the bulk of the goods produced by the members. The scope of the Association covered approximately only 25 per cent. of the manufactures of his own company.

Mr. N. L. MACASKIE (Counsel for the opponents), in reply to the chairman, said that the effect of a marking Order would be to restrict imports, and that might lead to a price ring.

In cross-examination, Mr. CLIFFORD said that the annual British production had increased by about 10 per cent. above that of 1924. Its value, therefore, said Counsel, would be between £800,000 and £900.000, which represented between 400,000 and 500,000 cwt. The total importation, however, amounted to about 29,000 cwt., so that it was only a small proportion of the British production. Again, between 10,000 and 12,000 cwt. of the imports consisted, not of porcelain, but of steatite, which was made by a German company which was responsible for the whole of the imports of steatite into this country.

Witness said he would be surprised to find that steatite was imported into this country for electrical ware to the extent indicated, and he would not agree that no steatite was made in this country.

Mr. MACASKIE asked why Messrs. Bullers had only reached the experimental stage with regard to steatite. Witness pointed out that experimenting in pottery was an extremely long process. In reply to further questions, witness said that the material was made from soapstone. He agreed that steatite was slightly better than porcelain for moulding, but that factor was only of value in very small articles.

Mr. MACASKIE said that as the foreign porcelain was white and the British was of a creamy colour they could be distinguished. Witness said that whilst this colour distinction did exist ten years ago, it tended to disappear. He maintained also that the non-expert could not distinguish steatite from porcelain.

Mr. MACASKIE asked if it were not the fact that the bulk of the electrical fittings were bought by people in the trade who could distinguish between them.

Witness said he regarded those traders who bought fittings as non-experts so far as distinguishing between the bodies of the two materials was concerned.

Mr. MACASKIE pointed out that in many electrical fittings, such as tumbler switches and ceiling roses, the metal parts were concealed by the porcelain, which was the most conspicuous part. Therefore, if that were marked, the whole article would be branded as foreign. Witness agreed that that might be so.

The fact that the Electrical Accessories Manufacturers' Association was not supporting the application was commented on by Counsel, but the Chairman pointed out that it was not opposing either.

Mr. MACASKIE suggested that it would be impracticable to mark certain fittings in the manner proposed, particularly in cases where coloured glazes were used; in some cases the articles would have to be fired two or three times. Witness said that the proposed marking was quite practicable, and none of the articles referred to would have to be fired a second time on that account.

Mr. MACASKIE asked if refractories used for electric heating and cooking apparatus were covered by the application. Mr. WETHERED (counsel for the applicants) said it was the intention to exclude them, but the CHAIRMAN said he thought that, on the face of it, the application included them.

Mr. MACASKIE claimed that if steatite articles were ignored the quantity of imports dwindled considerably.

Evidence was then called in opposition to the application.

Mr. C. C. MASON, O.B.E., M.A. (joint managing director of the Cambridge Instrument Co., of Cambridge) said that the proposed marking, so far as the porcelain used for the instruments made by his company was concerned, was both impracticable and unnecessary. The price of the English porcelain was approximately six times that of the foreign, and it was not nearly so good for its purpose. In many of the instruments produced by his firm the porcelain was the most conspicuous part, although, at the same time, it represented a very small part of the total cost. In this connection he exhibited a pyrometer recorder, of which his firm made about 1,000 a year, and exported about 30 per cent. of them. If the porcelain only were marked, to indicate that it was made abroad, the buyer was bound to be deceived, and would have the impression that the whole instrument was foreign. The marking of the porcelain only was illogical, because the instrument contained parts which came from half-a-dozen different countries, although 98 per cent. of the instrument was British, and produced by British labour. The cost of the porcelain was about 1/1,000th part of the total. Dealing with the use of steatite, he said that its mechanical strength was greater than that of porcelain, it was less brittle, and it withstood vibration and heat better. It could also be machined, whereas porcelain could not. If by using British porcelain the cost of production were increased by 6d., the catalogue price would have to be increased by 1s. The company did not wish to be handicapped in world trade by increased costs. Mr. Mason said that his evidence related only to porcelain used in scientific instruments; he had no knowledge of its use in electrical fittings. The requirements of instrument makers were very special and probably comparatively small.

Mr. F. L. BROWN (chairman and managing director of the Igna Engineering Co., Ltd.) said that his company had found that English porcelain cracked when used for sparking plugs, and they now used foreign steatite. If the steatite in sparking plugs were marked with an indication of origin it would create the impression that the plugs were foreign throughout, and would kill his company's trade in Canada and Australia.

Mr. F. G. MARTIN (director of Messrs. John Lawton & Sons, Ltd.) said that foreign porcelain was used by his company in the making of electrical accessories. The prices of the English and foreign porcelain were about the same, but the English porcelain parts used in lampholders were not always true to shape, so that cheap assembly was out of the question. Mr. WETHERED said he was informed that the General Electric Co. assembled Messrs. Bullers' products.

Mr. F. W. CHALLIS (secretary of the Electrical Importers' and Traders' Association) was questioned by Mr. Wethered as to why many of the large electrical manufacturing firms were not members of the Association and were not opposing the application. Witness pointed out that there were three main classes of members. Some were purely importers of electrical goods; some were importers, but were also to a large extent wholesale distributors of goods, including a certain quantity of foreign goods; and some, necessarily fewer in number, were manufacturers interested in a particular line of foreign goods used as raw material. Questions which were dealt with by such an organisation might affect manufacturers rarely.

Mr. BENZLEY (departmental manager of the Sloan Electrical Co., Ltd.) said that his company had for many years imported standard types of insulators, such as were used for telephonic and telegraphic purposes, as well as cleats, bobbins, &c., used for temporary or rough electrical installation work. The foreign material was easily distinguished from the English by its colour. Such goods were bought only by technical people, and there was no question of their being deceived. There was a fair re-export trade, but the bulk of the insulators which his firm exported were complete with their metal parts, and if the porcelain were marked the whole article would be branded as foreign.

Mr. H. M. HARRIS (director of Messrs. Harwell, Ltd.) said that the difference in colour between British and foreign porcelain was quite apparent, and the colour of steatite was different from that of either the British or foreign porcelain.

This concluded the evidence on this part of the application, and Mr. Macaskie's speech on behalf of the opposition was postponed until a later date

Electricity Supply.

Some Notes and Reflections on Recent Legislation.

By C. G. MORLEY NEW, M.I.E.E.

(*Abstract of Chairman's inaugural address at the* WESTERN CENTRE (CARDIFF) *of the* INSTITUTION OF ELECTRICAL ENGINEERS.)

THE electricity supply industry has been the subject of three Acts of Parliament since 1919. The Act of 1919 set up the Electricity Commission, and has been instrumental in co-ordinating to some extent plant extensions in various generating stations; it did something to assist the distribution side to obtain wayleaves for the erection of overhead lines, and the selling side by granting hiring powers to local authorities authorised to supply electricity. The problems now before the Commissioners are more formidable than those they have hitherto dealt with. The uncertainty arising out of the Acts referred to cannot be said to have so far seriously affected developments on the distribution side, but it has in many cases caused anxiety in meeting demands for electricity and arrested development on the generating side. We now know where we stand, although there must be some uncertainty as to the beneficial results expected of the schemes of re-organisation. The duty is imposed on the Electricity Commissioners of submitting schemes to the Central Board, and it seems likely that until these schemes are in operation development will be retarded in a number of instances, due to the uncertainty of being able to meet increased demands.

Standardisation of Frequency.—The scheme for Central Scotland is of peculiar interest to members in this area in respect of the change-over of large and important areas of supply from 25 to 50 cycles. This is a matter requiring considerable engineering skill and organisation, particularly with regard to consumers' apparatus, and during the progress of the work will probably cause some anxiety to those responsible for the maintenance of supplies. There will have to be some co-ordination of the programmes for the different areas similarly affected, otherwise the manufacturing resources of the country (particularly in motors) may be severely strained. Something, no doubt, could be done in this direction by co-operation between all those concerned, which should make for the smoother and more economical working of these formidable schemes. The immense amount of work involved may be imagined from the survey of the one area in question made in 1924: generating plant installed and on order amounted to 273,300 kW; plant for converting to direct current, 148,875 kW; and some 8,500 alternating-current motors, totalling 220,686 h.p.; the estimated net cost was £1,984,300, and to-day (three years later) is no less than £2,921,250; this increase of £936,950 (47.2 per cent.) is a striking illustration of the cost of delay; the gross cost to-day is £3,410,000, the difference of £488,750 representing antedated capital expenditure on distribution repayable by the undertakers involved. Such an expenditure could not be justified by the individual undertakers concerned on the score of the doubtful economy accruing to them, but in these schemes the burden of the standardisation of frequency is spread over the whole of the supply industry; in effect, this means that "standard areas" have to financially assist "non-standard" areas in obtaining the economies resulting from interlinking. A commendable national spirit is thus shown, or enforced on us, and it is hoped that it will result in the same spirit being shown up and down the country when it comes to the placing of orders by individual undertakings. The Commissioners, in their estimates of savings under the scheme, take into account the capital charges on transmission lines (£191,146) and the other expenses of the Board, totalling 0.0475d. per kWh sold, and indicate for the year 1933-4 a saving of £222,243, or 0.04d. per kWh. Bearing in mind that the annual charge for the frequency change is of the order of £180,000, it will be realised that direct benefit to the district if the charge had to be met by the district would be problematical.

All undertakings, particularly those working at standard frequency, are vitally interested in the cost this policy entails. The Weir report gives an approximate figure of £8,000,000 as the net cost of the complete change-over as conditions were in 1924. Assuming the same development as in Scotland, the cost to-day would be approximately £11,750,000, and the annual charge for 40 years, the period of the Central Scotland scheme, about £725,000. The Board will obtain the repayment of this amount from authorised undertakers through the Electricity Commissioners, who have to show this as a separate item in their demand notes for contributions to their expenses, an annual reminder of the cost of standardisation, without anything nearly so definite of the savings to put before committees and directors when the accounts are presented. Whereas the Commissioners' ordinary expenses are apportioned on the basis of kWh sold, the cost of the frequency change is to be made on revenue received from the sale of electricity. It will be appreciated that on this basis the cost per kWh will vary with different undertakings, and will be a definite percentage of the average selling price, whereas with the Commissioners' ordinary expenses the cost per kWh is the same to all undertakings. Taking the figure of £40,889,613, given in "Garcke's Manual," as the revenue received from the sale of energy by 394 supply undertakings for 1926, the additional cost due to the £725,000 loan charges will be £17.73 per £1,000 of revenue. In the case of the Cardiff undertaking this would mean a charge of £4,432 on a revenue of £250,000 for last year, compared with the Commissioners' ordinary expenses of £291.

The charge per kWh will, of course, decrease with increasing output, but on our last year's output it is equivalent to an increase of over 16 per cent. in our coal bill at to-day's cost of coal. As the sale increases from year to year, so will the percentage cost due to this charge decrease; but, assuming all undertakings progress equally in the matter of revenue, the annual cost per undertaking will remain the same: capitalised on the basis taken, Cardiff's contribution to the frequency-change is approximately £71,820 out of the total of £11,750,000, involving a total charge over 40 years of £177,280. The question of liquidating this liability earlier should receive the consideration of individual undertakings. Those undertakings that have in recent years met out of their own resources the heavy cost of similar works feel that they have a grievance in being called upon to meet this charge, in addition, and incidentally help provide some undertakings with large economical modern units in place of inefficient small ones.

These estimates are not put forward as an argument against the adoption of a standard frequency, but rather to show the debit side to the estimated economies expected from the scheme of centralisation of generation and inter-connection. Nationally there are many advantages, but many of us have to consider the direct effect on our undertakings against the indefinite indirect advantages, and it can at once be stated that the existing efficient generating stations cannot have so much to gain to offset these serious additional overhead charges. To illustrate this point, the Central Scotland scheme shows that in the Commissioners' estimates of *gross* savings for the year 1933-4 (the latest year for which the estimates are given, presumably because these are settled conditions, as they are the lowest for generating costs), the saving to one of the "selected stations" will be £2,852 on 376.42 million kWh, whereas "other undertakers" (that is, the stations which will be shut down) will save £49,073 on 59.89 million kWh. There may be something abnormal for that year so far as the particular selected station is concerned, but reference to other undertakings will show clearly that the inefficient will gain at the expense of the efficient.

Now that the standardisation of frequency has been decided on, the standardisation of distribution voltage, which would be of great benefit to consumers and of some benefit to supply authorities, is being seriously considered. Seeing that prior to the Electricity Commissioners, the Board of Trade's approval had to be obtained to any system of supply, it is a pity that the advantages of standardisation were not appreciated, and if they were, that "system of supply" was not construed to include both frequency and pressure of supply. Just imagine what could have been done to remedy matters with the money spent last year in importing coal to keep supplies going.

Generation.—It has been stated that the 1926 Act deals particularly with generation, and that it is in this connection direct economies are anticipated. The responsibility for generation, instead of resting with some 480 stations, will be in the hands of comparatively few, and a number of engineers will therefore in course of time cease to interest themselves in the engineering details, but will be keenly interested, without any control, in the financial side of this part of supply work. Comparison of the returns for 1920-1 and 1925-6, which include railway and tramway stations, shows an improvement in the average fuel consumption of 0.92 lb. per kWh, which, on the output for the latter year, is equivalent to about 3,200,000 tons. It is too much to hope for a similar reduction in the future, although it must be borne in mind that economies of this sort are cumulative in their effect with increasing output. It is clear that the schemes to be put into operation must inevitably bring about in course of time a levelling up of generating costs, and that the uneconomical stations will participate in the economical results effected by others—a fine example of Christian socialism, but truly Gilbertian when we think of the friendly rivalry which has existed for so many years between the four hundred odd stations set up by previous legislation being wiped out by the operation of new legislation. It might reasonably be asked: where is the incentive to provide "selected" stations under these circumstances?

Distribution.—As there is every prospect that the phenomenal activity of the past few years is likely to continue for some time, engineers (and they will be many) who find themselves relying on bulk supplies will have plenty of scope for their energies, with increasing responsibilities incidental to increasing consumers and outputs, which it is hoped will be fully recognised by employers. Stress has been laid on the subject of efficiency

in power stations, but in the future we shall be more concerned with the ultimate cost. In distribution, efficiency, as such, is a more difficult problem, and, whilst we all wish to settle down and digest the legislation which has been thrust on us, we may have to become resigned to further legislation, affecting distribution, when the reorganisation of generation is out of the way. There seems just now to be a rush for Special Orders to cover comparatively small areas, and where saving is made on generation it may be thrown away on distribution in small areas separately administered. It must be a very controversial subject, but, if it is really the general desire that all shall have equal facilities for cheap supplies, then something will have to be done whereby comparatively small distributing areas can, or shall, avail themselves of the organisation of large undertakers in their vicinity who at the present time, unless by arrangement of taking over these areas, are limited to supplying in bulk to them

Rural Supplies.—A number of engineers vitally interested in overhead-line work consider that the Commissioners can assist in reducing costs by the relaxation of some of their rules, and, further, consider it is about time that the unique privileged position of the Post Office should be materially altered to place it on the same basis as other trading undertakings. No doubt the potential power load is very great, and in the United States of America it is stated that one million farmhouses will be served by 1932, and that by 1938 the number will be raised to three millions, the probable outlay being estimated at no less than £200,000,000, borne equally by the farmers and the electrical undertakings.

Trade Prospects.—All undertakings have during recent years reported a large increase of consumers and domestic apparatus connected, which is likely to continue, for, apart from the resulting economies expected from the reorganisation of generation, the granting of selling powers to all local authority undertakings is resulting in the connecting up of consumers who would not otherwise be obtained. An increasing number of undertakings are operating schemes whereby installations and apparatus are provided on easy deferred-payment terms, and a feature of a good proportion of these schemes is the preference shown for British materials and contractors on the National Register of Installation Contractors. Our Institution was instrumental in promoting this voluntary registration, and it is pleasing to note that the movement is making considerable headway.

If a standard voltage comes about as well as a standard frequency, it may be expected that a reduction in costs will result, opening up a larger market to the benefit of all. A lot of work will be available for those industries concerned with overhead transmission lines, and there seems no necessity to go outside this country for work of this character, thanks to the development work undertaken for export requirements; the same remarks apply to all materials and plant. Reference has already been made to the large amount of work, particularly motors, involved by the change of frequency, and it would be a tragedy if, for want of co-ordination, orders have to be placed elsewhere than in this country, say, on the score of delivery.

We constantly see advertisements that hitherto never seemed necessary, *viz.*, "Buy British Goods." During the war so much unselfishness was shown by our people towards each other that a reaction seems to have set in here and there, resulting in individual advantages (if we accept their conclusions) at the expense of the nation as a whole. It is fortunate that the majority do not act in this manner, or we should very soon be looking about for the wherewithal to make any purchases at all.

Correspondence.

Correspondents should forward their communications as early as possible. *No letter can be published unless we have the writer's name and address in our possession.*

The A.S.E.E. Presidential Address.

In your issue of October 21st, under the heading of "Notes," reference is made to the above address, the subject being the training of an electrical engineer.

In this, no doubt, excellent address, which I have not had the pleasure of reading, Mr A. M. Sillar stresses the importance of "skill in the use of tools," and the value of acquiring this in youth, and also deplores the fact that individual skill has fallen to a lower average since the war.

With the first part of the above statement, I heartily wish that I could conscientiously agree. Important it is, without a doubt, to the electrical industry, but what of its value to the individual? The second part is only too true. Whilst material has improved in quality, and accessories of all kinds have been, or are being standardised and simplified, it is a fact that the standard of workmanship has deteriorated. This may be due to a variety of causes, but the results required in any particular industry may generally be obtained, if the right course is pursued.

To examine one aspect of the situation:—

(1) What inducement is held out to the mechanic to acquire more than average skill, *i.e.*, the bare minimum required to retain his job?

(2) What are his chances of promotion to administrative or supervisory posts?

(3) Does his skill in the use of tools enhance the above possibility, or does it react unfavourably?

(4) When candidates for salaried positions are interviewed, how many wage earners, however skilled, or qualified, are even considered?

From the writer's experience these queries can be very easily and briefly answered, and they could be considerably extended. The mere fact that he works with tools for a living, in the form of wages, is sufficient in itself to debar the mechanic from advancement, whatever his skill, capabilities, or qualifications may be.

After a long and varied practical experience in electricity supply and installation work, and considerable success in technology, it has never yet been my good fortune to secure an interview, relating to my numerous written applications for advertised posts.

Another disadvantage from which the skilled craftsman suffers is that at a comparatively early age he is superseded by a younger man, more particularly if his work is of an arduous nature, or demands keen eyesight. He then frequently becomes a burden to others, and all too often ends up in a poor-law or similar institution.

My advice to the young ambitious craftsman is to "drop the tools" while there is yet time, or at any rate to reserve them for his hobbies, and to seek more lucrative, or more promising employment, and to intending craftsmen I would recommend *Punch's* famous advice to those about to be married —*don't.*

Only A Wireman.

October 27th, 1927.

Overhead-Line Costs.

With regard to the letter of Mr. J. A. Morton, of British Insulated Cables, Ltd., in your issue of October 7th, questioning the statements made in my article of September 23rd regarding the cost of overhead lines in rural districts in France, I have now received some figures from the other side of the Channel which may prove of interest; they are given me as average figures for this class of work:—

Estimate of cost of line, 15,000 volts, 3 conductors, 4 mm. (0.157 in. dia.) (No. 8 S.W.G. is 0.160) on sectional armoured-concrete poles:—

Normal span 90 metres (98 yards).

Number of posts per kilometre: 10 straight line posts, 1 for angle of 20 degrees, 1 for 35 degrees.

Height of support:—

Maximum sag at 40 deg. Centigrade	1 m. 55 = 5 ft. 1 in.
Space taken by brackets	0 m. 80 = 2 ft. 7 in.
Minimum height to ground	6 m. 00 = 19 ft. 8 in.
Foundations (rectangular base) ...	1 m. 60 = 5 ft. 3 in.
	9 m. 95

That is to say, posts of 10 metres' length.

For posts delivered 450 kilometres from point of manufacture:—

Price of concrete posts delivered ...	3,310 fr.
Erection of posts	1,800 fr.
Ironwork, insulators, notice plates	700 fr.
Copper, 370 kg. at 10 fr.	3,700 fr.
Erection of line	300 fr.
Line erected ready for operation ...	9,810 fr. per km.

(Fr. per mile, 15,784; at 125 fr. per £, £126 2s.)

In addition I am informed that, while with telephone crossings (under the regulations) nets are "theoretically necessary," they are very rarely enforced. I agree that prices have risen somewhat since the figures were given me last year, but not enough to alter seriously the ratio to English prices. I do not deny that many difficulties are to be met with at home, many of them removable, but existing minimum costs could be materially reduced. There are certain points of importance.

In France and on the Continent generally there are not so many hedges; cattle in some districts are tethered; roads as a rule are wider; where there are hedges there are fewer trees. Thanks to the fact that the French Government is genuinely anxious to help agriculture, the French Post Office is not made the supreme boss; the officials of the Travaux Publiques are largely University trained engineers, who are encouraged to assist progress. As a matter of fact, the same standard is not demanded for the plains as for snow-ridden mountain passes. It is realised that in rural areas the distribution costs are the main item, and that to make all lines blizzard-proof would be to deprive many areas of the possibility of getting power at all, considering capital cost and current interest charges. It is realised that in a storm the whole population of a village does not go out of doors and sit under the power lines in a row and wait for them to fall, as our Whitehall regulations and policy would imply. Probably 90 per cent. of the rural lines in France are constructed without earth wires, although with concrete posts galvanised earth plates are frequently used; all the same, it is possible to use the telephone there without material danger of eardrum-breaking or fear

of instant electrocution. Apparently they do not demand a theoretical strength for a pole greater than what normal foundations would stand, neither do the officials assume that they have a different gravity to their neighbours and that they live on a different planet to other countries. Lines with light concrete posts cost about the same as with wood posts as the spans used are longer.

At interest repayable over a term of years the French Government makes grants on loan to communes, groups of communes, and such-like bodies, which can arrange for operation if desired with private undertakings, the money to be spent on the erection of rural lines. Last year a prominent headquarters official informed me that some local authorities were asking for 10,000 fr. per kilometre when he knew that rural lines were being put up for 9,000 fr. and under, a striking confirmation of my figures. If common sense has any influence when a hard-up Government puts up money to build lines, it would naturally urge its officials not to waste money by insisting on safeguards that experience of years had proved to be unnecessary.

In Sweden snow conditions are very severe; there are far more telephones per head than we have, and therefore more telephone lines to cross, and yet Dr. Ekström in the ELECTRICAL REVIEW of August 12th, 1927, gives figures of £125, £150, and £175 per mile for rural lines, the last for 20,000 volts; these figures must be also "manifestly impossible"! Sweden has not a depreciated currency, but in France labour costs have increased enormously since 1914.

In the United States labour costs are very high, and yet last year Mr. G. C. Post, of the Milwaukee Electric Railway and Light Co., in a paper read before the American Institute of Electrical Engineers, stated that "The cost of a single-phase primary line exclusive of transformers, lightning arrestors, secondary mains and services, was approximately $750 (£150) per mile in country where there was little trouble with trees and where there was neither rock, nor too much gravel, to interfere with pole setting." (See ELECTRICAL REVIEW, September 10th, 1926, page 440.)

In some districts on the Continent, before the war, where cablemakers had financial interests in supply companies, overhead lines were proclaimed to be dangerous; according to the letter of the regulations there was but little advantage with them. Perhaps village worthies and long-haired artists with remarkable synchronism also proclaimed that overhead lines would spoil the country-side, &c. After the war France like some other countries, realised that money was *some object*, and in 1919 I was informed by a cablemaker's engineer that they had had to alter their policy. A cheap rural line means more house wiring, with innumerable appliances requiring insulated wires; rural industries mean electric motors which require quantities of cotton-covered conductor; every transformer involves material made by cable-makers, and yet some of our cable people still passively resist overhead lines. At home Messrs. Johnson & Phillips, with their oversea experience, were among the first to realise the value of such lines, followed by the B.I., Siemens, Henley's, and others; every shilling reduction in capital cost per mile must lead to more business. Abroad much of the rural line work is done by comparatively small undertakings with low capital charges, the larger concerns reaping considerable indirect benefit.

Theodore Rich.

Woldingham, Surrey, *October 26th*, 1927.

Ultra-Violet Rays.

I should like to add a few notes to Mr. Chas. A. Cooper's article on "Ultra-Violet Rays in Therapeutics" which appeared in your issue of October 21st. He omits reference to the long-flame arc lamp which is largely used in hospitals and clinics all over the country. This type of lamp, burning with 75 to 80 volts across the arc and a current of from 20 to 30 amperes, gives a light rich in ultra-violet radiation and at the same time with a good percentage of the longer rays which are necessary for deep penetration.

The emission of ultra-violet rays is proportionately greater with the longer arc, and our object is always to supply a lamp to burn the longest possible open arc consistent with steadiness.

The mercury-vapour lamp gives a light rich in the short rays but deficient in the longer rays, and has but little penetration, although producing quick erythema. The carbons burned in our long-flame lamps, which appear most effective, are the iron-cored type for quick pigmentation, or the cerium-cored white-flame type which gives less of the short rays but deeper penetration. Some extremely interesting particulars are given of relative values, &c., in papers by Mr. T. C. Angus, of the National Institute for Medical Research, and anyone interested should see these in the *British Journal of Actino-Therapy* for March, April, and August, 1927. Mr. Angus also finds that there is practically no disadvantage in using alternating current; he says: "An a.c. arc has about 85 per cent. of the U.V. output of a d.c. arc of similar energy, but in practice it may still be the more economical of current because (*a*) it may take its current from a transformer, and (*b*) there may be used with it a choking coil instead of a series resistance, thus saving heating loss." There is a widespread idea that medical arc lamps are not successful on a.c. This is quite erroneous; we are assured by users at some of the largest hospitals that the results are equally good, and no one need hesitate about installing medical long-flame arc lamps, whether the current is a.c. or d.c.

Mr. Cooper has certainly summarised the matter very well; the above few remarks may serve to amplify his article.

J. O. Girdlestone,
THE WESTMINSTER ENGINEERING CO., LTD.

London, *October 22nd*, 1927.

Small S.p. Commutator Motors.

Could you, through the medium of your columns, inform me of makers' names of a small 230-volt, a.c., single-phase commutator-type motor with laminated fields and series wound, 50 cycles? The motor should be of ¼ horse-power, and it is to drive a telescope and clocks in an observatory. Three or four motors are required, and the speed should not exceed 400 r.p.m.

Telescope.

October 28th, 1927.

Legal.

Workmen's Compensation Case.

IN the Mayor's and City of London Court, before Judge Shewell Cooper, on October 24th, Mr. C. R. Howell, Upton Park, E., labourer, was the applicant, and the India Rubber, Gutta Percha and Telegraph Works Co., Ltd., 106, Cannon Street, E.C., were the respondents in arbitration proceedings under the Workmen's Compensation Act, by which the applicant claimed 29s. a week for incapacity caused by an accident on March 17th last. He was, he said, assisting to carry a roll of rubber when his fingers were caught in a calender machine. The fingers of his right hand were crushed, and at the present time he could bend only the fore finger and the thumb, the remainder being quite stiff. His salary at the time was £2 18s., and he subsequently was given light work, forcing sulphur and pigments through a screen, but it caused his hand to blister, and he had to give that up. He was then given other work, which he managed quite well, but he was discharged owing to slackness of trade. He had tried to get work as a fitter's mate without success. Medical evidence was given that the applicant had no grip in his right hand except between his fore-finger and thumb. Judge SHEWELL COOPER said he was satisfied that the applicant was a workman ready and anxious to earn wages. In view of the fact that he was receiving unemployment pay, the most he could award him was 14s. a week, and the costs of the application.

Wireless Traders without Licences.

THE defendants in five prosecutions under the Wireless Telegraphy Act, which took place at Plymouth on October 28th, were all connected with the radio trade, either as proprietors or managers of shops.

Arthur Brand, ironmonger, was summoned for aiding and abetting the working of radio apparatus without a licence. Mr. MAYBURNE PEARCE, who prosecuted on the instructions of the Postmaster-General, said that defendant was the owner of a wireless business in Plymouth, which was managed for him by Mr. Brock. When seen by an official, defendant admitted that he was responsible for the business, but expressed surprise that a licence had not been taken out. Mr. F. W. MURRAY, who pleaded guilty on defendants' behalf, said that the matter was an oversight, and that there was no attempt at evasion. A fine of 40s. was inflicted, and fines of a similar amount were likewise imposed in the cases of Cecil Brand and Lena Brand, who were also summoned for working radio apparatus at their establishments without licences.

Reginald Turner, manager of another wireless shop, was summoned for working an apparatus without a licence, and Edward Stoneman, the owner of the premises, was summoned for aiding and abetting. Letters were read from the two defendants, who pleaded that the matter was an oversight. Turner was fined 10s. and Stoneman 40s.

Western Electric Patents Extended.

MR. JUSTICE TOMLIN, in the Chancery Division on October 27th, heard a petition by the Western Electric Co., Ltd., for the extension of the period of patents for improvements in the wiring of contacts for telephone switches, and in switching apparatus for interconnecting the lines of automatic telephone systems, on the ground that the petitioners had been deprived of the full benefit of working them by the war.

MR. TREVOR WATSON, for the petitioners, asked for an extension of five years. He said the normal output was affected; over a period of six years it was reduced to about one-sixth.

MR. STAFFORD CROSSMAN, for the Comptroller of Patents, suggested that the loss would be covered by an extension of 3½ or 4 years.

His Lordship granted an extension of four years.

Faraday House Old Students' Association.

Annual Dinner.

On Friday, October 28th, the annual dinner of the Faraday House Old Students' Association was held at the Savoy Hotel, London. The President, Mr. J. Francis Watson, occupied the chair, and amongst the 250 members and guests were Mr. A. Page (president I.E.E.), Sir Chas. Morgan, C.B.E., Sir Tom Callender, Mr. T. P. Wilmshurst (Electricity Commissioner), Dr. S. L. Pearce, O.B.E., Dr. A. Russell, F.R.S. (principal of Faraday House), Sir James Devonshire, K.B.E., Col. R. K. Morcom (chairman, B.E.A.M.A.), and many other distinguished visitors.

After "The King" had been duly honoured, Mr. Archibald Page proposed the toast of "Faraday House and its Old Students," pointing out the advantages derived both by the Institution of Electrical Engineers and by Faraday House from their close association and the flow of students from the latter to the former. Knowledge was power only when combined with practical experience, and the College, by its collaboration with the manufacturing industries, achieved a very close approximation to the ideal. Those still associated with Faraday House need not be nervous about the future; electrical exports were increasing, and the reorganisation of the electricity supply industry would call for many more young engineers. Thanks to the "grid," fewer generating engineers would be required, but the great development of the sales branch would absorb far more than would be displaced. Dr. Russell had many claims on their esteem and affection; he combined a high degree of scientific knowledge with a great facility in imparting knowledge to others.

Responding, Dr. Russell said the Institution was to be congratulated on having such a popular president, whose high attainments admirably qualified him for the post. Faraday House now had over 300 students, and the team work of the staff was excellent; over 150 firms were affiliated to the College. Since the last dinner 170 Faradians had secured appointments.

Mr. CHARLES D. TAITE proposed "The Guests," remarking that that function brought together those who were starting their careers and those who had attained eminence. Sir RICHARD GREGORY responded, in a lively and humorous speech, and remarked that knowledge was of no use till it was applied—Faraday House was out to apply knowledge, and all electrical engineering, from Faraday onwards, had rested on applying scientific knowledge for the benefit of the human race. Sir CHARLES MORGAN, also responding, referred to the enormous influence of Dr. Russell over his students, who acquired not only knowledge but also character.

The health of the chairman was proposed by Mr. LL. B. ATKINSON, who said that Mr. J. F. Watson had been with the great firm of Callender's for 20 years; before the war he was head of the research laboratory, and during the war he was of great assistance to the Admiralty. He was one of the first to recognise that cables for pressures over 25,000 volts presented entirely new problems. Over 12 years ago his company had laid 33,000-volt cables successfully, and since then it had tackled much higher pressures. All recognised in Mr. Watson a master of his craft, who was willing to share his great knowledge and experience with others. At Mr. Atkinson's request, Sir TOM CALLENDER supported the toast, paying a warm tribute to the ability and helpfulness of the chairman, who had the complete confidence of the directors. Callender's was one of the first companies to be associated with Faraday House, and had a very high opinion of its students.

Mr. J. F. WATSON, in reply, bore testimony to the efficiency of the training given by the College, which left nothing to be desired, and he expressed their indebtedness to Mr. H. Foulds, to whose initiative the Old Students' Association was due.

A programme of music was performed during dinner by the Savoy Hotel Band, and after an interval following the speeches, an excellent musical entertainment arranged by Mr. Marius B. Winter was heartily enjoyed.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1925.

14,571. "Conversion of modulated electric current into a series of telegraphic impulses, particularly applicable to photo-telegraphy." M. L. D. McFarlane. April 1st, 1926. (278,051.)

1926.

12,180. "Radio receiving systems." O. M. Leich. May 11th, 1926. (278,400.)

13,101. "Timing devices for electrical toasters and like apparatus." C. F. Amos. January 15th, 1927. (278,401.)

14,372. "Welding or cutting by the electric arc." Soc. Alsacienne de Constructions Mécaniques. October 15th, 1925. (259,916.)

14,574. "Loud-speaking telephonic receivers." S. Z. de Ferranti and Ferranti, Ltd. June 9th, 1926. (278,406.)

16,775. "Electric switchgear." F. B. Cox. July 5th, 1926. (278,421.)

16,798. "Dry charged battery plates." Silica Gel Corporation. July 13th, 1925. (255,059.)

16,900. "Electric motors for use in the reception and transmission of electrical impulses." H. J. Creffield. July 6th, 1926. (278,430.)

16,941. "Electrolytic deposition of chromium." General Motors Corporation. July 6th, 1925. (254,757.)

17,319. "Alloys and their application to the manufacture of electrical conductors." W. S. Smith, H. J. Garnett and J. A. Holden. July 10th, 1926. (Cognate application 24,643/26.) (278,454.)

17,150. "Microphones." H. J. Round. July 8th, 1926. (278,443.)

17,214. "Electrolytic cells." A. E. Knowles. July 9th, 1926. (278,447.)

17,324. "Electric time switches." H. Aron Elektrizitatszahler-fabrik Ges. July 11th, 1925. (255,097.)

17,325. "Electromagnetic devices suitable for use with sound recording and reproducing devices and the like." Western Electric Co., Inc. November 3rd, 1925. (260,946.)

18,219. "Systems of electric motor control." British Thomson-Houston Co., Ltd., and C. J. H. Trutch. July 22nd, 1926. (278,467.)

18,458. "Electro-vibration translation devices such as telephone transmitters or receivers." A. G. D. West and British Broadcasting Co., Ltd. July 23rd, 1926. (278,469.)

18,459. "Electro-mechanical vibration translation devices such as telephone transmitters or receivers." A. G. D. West and British Broadcasting Co., Ltd. July 23rd, 1926. (278,470.)

19,377. "Insulating rods." British Thomson-Houston Co., Ltd., H. W. H. Warrem and R. Newbound. August 5th, 1926. (278,476.)

20,034. "Wireless transmission and reception systems." J. Robinson. August 13th, 1926. (278,479.)

21,371. "Mercury-vapour rectifiers." Akt. Ges. Brown, Boveri et Cie. May 17th, 1926. (271,024.)

22,413. "Starter, dynamo, and ignition units for internal-combustion engines." K. Greaves. September 11th, 1926. (278,499.)

22,645. "Systems for transmitting angular motion electrically." British Thomson-Houston Co., Ltd. September 14th, 1925. (258,297.)

23,738. "Gramophones and loud-speakers." A. B. L. Crowe. September 25th, 1926. (278,513.)

26,059. "Methods for the maintenance of constant potential or constant current in electrical circuits." Sir W. Noble and N. J. McAinsh. October 19th, 1926. (278,530.)

26,879. "Valve holders or adaptors for wireless apparatus." E. K. Cole. October 27th, 1926. (278,531.)

30,688. "Process for the production of electrically insulated wires and cables." M. Kubierschky and Akt. Ges. Mix & Genest-Telephon und-Telegraphen-Werke. December 3rd, 1925. (262,465.)

31,720. "Methods of control of electric power." British Thomson-Houston Co., Ltd. December 15th, 1925. (263,152.)

1927.

2,197. "Excess current protective devices, more particularly for unattended power stations." Akt. Ges. Brown, Boveri et Cie. April 26th, 1926. (269,852.)

3,330. "Loading coils." Siemens & Halske Akt. Ges. February 6th, 1926. (265,614.)

6,498. "Röntgen tube." Siemens-Reiniger-Veifa Ges. für Medizinische Technik. April 3rd, 1926. (268,742.)

7,918. "Protective devices for transformers." Allmanna Svenska Elektriska Aktiebolaget. December 21st, 1926. (278,591.)

8,258. "Means for preventing eddy current losses in multiphase alternating-current motors." Allgemeine Elektricitats-Ges. March 25th, 1926. (268,371.)

8,610. "Adapters or connectors for use in connection with electrical installations." G. C. Lundberg, P. A. Lundberg and G. Pegg. March 29th, 1927. (278,598.)

9,828. "Portable electrically-operated vacuum cleaners." Siemens-Schuckertwerke Ges. and K. Mackenrodt. April 9th, 1927. (278,603.)

10,579. "Gas-tight capsule for the separation of a rotor from a stator in driving motors for electrically actuated refrigerating machines." C. Baumann. May 28th, 1926. (271,838.)

11,284. "Fixing device for lighting-magnetos in road vehicles." L. Hemmeler. May 10th, 1926. (270,687.)

11,467. "Method of connecting the plates of electric condensers to their supports." F. Horny. January 25th, 1927. (278,610.)

12,170. "Mercury-vapour rectifiers and like apparatus." General Electric Co., Ltd., and E. Weintraub. May 6th, 1927. (278,615.)

12,248. "Sparking plugs." C. R. Skidmore. May 6th, 1927. (278,616.)

12,580. "Make-and-break for the electric ignition devices in internal-combustion engines." R. Bosch Akt. Ges. June 14th, 1926. (272,463.)

14,723. "Electric arc welding." British Thomson Houston Co., Ltd. June 2nd, 1926. (272,218.)

16,055. "Electric motor control." British Thomson-Houston Co., Ltd. July 15th, 1926. (274,437.)

16,613. "Process for the manufacturing of metallic diaphragms for talking-machines." R. Reinert. June 26th, 1926. (273,308.)

17,416. "Electromagnetically operated direction-indicators for road vehicles." G. Unterberg. August 11th, 1926. (275,948.)

17,877. "High-frequency electric transmitting apparatus." Westinghouse Electric and Manufacturing Co. August 7th, 1926. (275,581.)

18,086. "Motor power installations." British Thomson-Houston Co., Ltd. July 7th, 1926. (274,097.)

18,541. "Method for making edge-wound coils." G. H. Whittingham December 11th, 1925. (Divided application on 262,775.) (274,135.)

18,631. "Methods of and apparatus for starting alternating current motors." British Thomson-Houston Co., Ltd. July 15th, 1926. (274,476.)

19,852. "Synchronising of clocks." O. Muck. May 12th, 1926. (Divided application on 276,049.) (277,923.)

20,108. "Method of manufacturing hollow cables for overhead high-tension lines." Felten & Guilleaume Carlswerk Akt. Ges. July 31st, 1926. (275,252.)

20,782. "Incandescent lamps for electroliers with reflectors." B. A. G. Turgi. August 7th, 1926. (275,655.)

22,964. "Thermionic oscillation generator." British Thomson-Houston Co., Ltd. September 1st, 1926. (277,008.)

CORRECTION.—Published specification 32,813 referred to in our issue of October 14th (Ceiling electric switches. December 28th, 1926) should have been numbered (277,533), and not (266,533) as printed by us.

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from October 26th. In the case of foreign applications, the names and addresses of the British representatives are also given:—

Folio. Nos. 482,114, 482,115, 483,116 and 482,117. All goods in Classes 6, 7, 13 and 18.—Siemens-Schuckertwerke Gesellschaft, Berlin. (Haseltine, Lake and Co., 28, Southampton Buildings, W.C.)

Bulldog and Torch Light (design only). No. 483,886. Class 8. Primary batteries, electric accumulators, and parts thereof.—A.F.A. Accumulators, Ltd., 9a, Diana Place, Euston Road, N.W.1.

Meltrope. No. 484,003. Class 8. All goods in Class 8.—Amplifiers, Ltd., 49-50, Parliament Street, S.W.1.

Caydon. No. 484,253. Class 8. Radio-telephonic receiving sets and parts thereof, loud speakers, telephonic apparatus, &c.—Campbell & Addison, 40, Howland Street, Fitzroy Square, W.1.

Kondu. No. 476,063. Class 13. Electrical fittings, &c., and parts thereof.—Erie Malleable Iron Co., Erie, Pa., U.S.A. (White, Langner, Stevens & Parry, 88-90, Chancery Lane, W.C.2.)

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

AYRSHIRE.—Extensions (£60,000) at L.M.S. Hotel, Turnberry; Messrs. William Taylor & Son, Glasgow, Ltd., contractors.

BARNBY DUN.—School for West Riding E.C.; director of education, County Hall, Wakefield.

BARNET.—Grammar school (£52,500), for the Herts E.C.; director of education, Hertford.

BARNSTAPLE.—Extensions to North Devon Infirmary; J. C. Southcombe, architect.

BEXHILL.—Houses, Peartree Lane and Turkey Road; J. H. Lye, Chepbourne Road. Houses, Colebrook Road, Terminus Avenue and South Cliff; J. E. Maynard, Collington Avenue.

BIRMINGHAM.—Lock-up shops with flat, Stoney Lane and Church Road, Yardley; F. H. C. Wiltshire, town clerk. Cinema (to hold 1,800), Hawick Lane, King's Heath, for Councillor C. Lucas, 28, Cambridge Road, King's Heath.

BLACKBURN.—Annexe to Queen's Park Hospital for Board of Guardians; G. A. Pye, clerk to the Guardians, Union Offices, Cardwell Place.

BLYTHE BRIDGE (STAFFS.).—Block of business premises, for the Burslem and District Co-operative Society; secretary.

BOURNEMOUTH.—Secondary school, Iford Estate; Education Committee. Additions, Lancaster Hotel, Southcote Road; Mr. J. F. Jones. Alterations, Norwich Road; Bobby & Co., Ltd.

BRIDGWATER (SOMERSE).—Beet sugar factory (£400,000); British Sugar Developments, Ltd., 111, St. George's Square, London.

BRIGG (LINCS.).—Beet sugar factory; Sugar Auxiliaries, Ltd. School for Lindsey E.C.; Scorer & Gamble, architects, Bank Street Chambers, Lincoln.

BURNLEY.—Covered market and lock-up shops; borough surveyor.

BURTON-ON-TRENT.—Block of shops. Borough Road, for the Co-operative Society; secretary.

BURY.—Extension of the Technical College; director of education, Education Offices.

CROYDON.—Town Hall extensions; Special Committee. Showroom and office, Brighton Road; W. J. Frewing. Blocks of flats, Upper Coombe Street; S. E. Moss, Southend.

DALTON.—School (£12,126), Sunnyside, for West Riding E.C.; education architect, Wakefield.

DERBY.—Works, Sinfinmoor, Normanton (£160,000), for the Macintosh Cable Co.

DEWSBURY.—Houses, with electrical work, Bywell Road; Horace Green, 556, Huddersfield Road, Ravensthorpe.

DUNDEE.—Buildings in Caird Hall Square; Anderson, Gardner, Hepburn & Co., solicitors, Dundee, agents.

DURHAM.—Additional housing scheme (208), for the R.D.C.; surveyor.

FIFESHIRE.—Branch shops for Townhill Industrial Co-operative Society; the manager.

GATEACRE (LIVERPOOL).—Electric lighting, St. Stephen's Church; James K. Wilkie & Co., consulting engineers, 203, Royal Liver Buildings, Liverpool.

GLASGOW.—1,442 three-apartment houses, 522 four-apartment houses, and 14 five-apartment houses at Carntyne, for Corporation Housing Department (£945,483); city architect. Ice rink at Crossmyloof for Scottish Ice Rink Syndicate, Ltd., 190, West George Street, Glasgow (£20,000); the secretary, 190, West George Street. Shops at Possilpark for Corporation Housing Department; city architect. Factory in Bridgeton, for James Templeton and Co., William Street, Greenhead; the manager. 76 houses; Mactaggart & Mickel, Ltd., builders. Greyhound track adjoining Ibrox football ground, for Albion Greyhounds, Ltd.

GLOUCESTER.—Re-erection of depository (£3,000), Clegram Road, for Blinkhorn, Ltd.

GUILDFORD.—Reconstruction, Trinity Hospital; W. H. Godfrey, consulting architect for governors.

HAMPTON HILL.—School (£14,450), for Middlesex E.C.; Leslie & Co., Ltd., builders, Kensington.

HASTINGS.—Private hotel, Warwick Square, reconstruction 7, 8, 9 & 10, Breeds Place, and 1, Castle Street; Callow and Callow, architects.

HIGH WYCOMBE.—Factory extensions, London Road, for the Wycombe Marsh Paper Mills Co., West Wycombe Road, for Goodchild Bros., Mendy Street, for Goodearl Bros., and Oakridge Road, for Barlow & Co. School (£7,635), for the Borough E.C.; director of education.

HERTFORD.—Boys' grammar school (£40,000); J. W. Fisher, architect, Wellingborough.

INVERNESS.—Reconstruction and extension of premises, Church Street and Academy Street, for Maciver & Co., house furnishers.

IRISH FREE STATE (BANDON, CO. CORK).—Technical school, County Technical Instruction Committee.

(VENTRY, CO. KERRY).—Extension of Burnham House, for Commissioners of Public Works; direct officer of works, Killarney.

KINROSS.—Alterations to County Buildings (£2,500); county clerk

LEICESTER.—Salvage and electricity plant for destructor; Heenan & Froude, Ltd. Two schools, Corporation housing estate; County Education Committee.

LETCHWORTH.—School and civil college (£40,000), for Herts E.C.; director of education, Hertford.

LONDON (BARKINGSIDE, E.).—Church with electrical work (£12,000), for the Wesleyan trustees; Smee & Houchin, architects; A. D. Jackson & Son, builders, Southend.

(WEST HAM, E.).—Flats, to cost £167,694, for the T.C.; builders, R. J. Rowley, W. Jones & Sons, and Gee, Walker & Slater, Ltd.

(HIGHGATE, N.).—Aeroplane hangar, Highgate School building Southwood Lane; Mr. A. E. Munby, 9, Old Square, Lincoln's Inn.

(HENDON, N.W.).—Technical school, The Hyde, Middlesex Education Committee.

(NORWOOD, S.E.).—Extensions, St. Joseph's College, Beulah Hill; Mr. B. J. MacAdam, 33, Brook Street, W.C.

(KENSINGTON, S.W.).—Welfare centre, Sirdar Road (£4,500); borough engineer.

(STREATHAM VALE, S.W.).—Church hall (£4,700), for St. Andrew's Church; Sir Charles Nicholson, architect.

(TULSE HILL, S.W.).—Block of flats, Upper Tulse Hill; Mr. G. Hayden Bosher.

LUDDENDEN FOOT.—School (£14,500), for West Riding E.C.; education architect, Wakefield.

MAIDENHEAD.—Adaptation Cranfurd College as mental institution; Middlesex C.C.

MAIDSTONE.—Elementary and girls' grammar school; director of education.

MANCHESTER.—Elementary and central schools, Beaver Road, Didsbury; Education Committee.

NEWCASTLE.—Quay sheds; city engineer. Laboratories, North Heaton School; Education Committee.

NORMANTON.—Electric light installation at Girls' High School and Technical School; T. R. Robinson, clerk to governors, Technical School.

NOTTINGHAM.—Baptist church, for trustees, Queensberry Street Baptist Church; Rev. J. Campbell Lee, pastor.

OLDHAM.—40 houses, Heron Street; F. Lord.

PAISLEY.—Extension of the Museum; burgh surveyor.

RYE (SUSSEX).—Roman Catholic church, Watchbell Street; priest-in-charge.

ST. ALBANS.—Church, Hadfield Road (£4,000), for the Wesleyan trustees; secretary.

ST. AUSTELL.—Extensions to Technical School; B. C. Andrew, architect, New Inn Chambers.

ST. HELENS (LANCS.).—Extensions to Factory, Miera Art-Silk Co.

SEAHAM HARBOUR.—Warehouse, North Terrace; Metcalfes Stores, Ltd.

SHIPLEY.—36 houses, Nab Wood Drive; A. & J. Chippindale.

SITTINGBOURNE.—Re-erection of business stores (£6,000), for the Green Street Co-operative Society; secretary.

SOUTHPORT.—Houses (86), for H. V. Sutton; Stevens and Dean, architects.

SWANSEA.—53 houses, Grenfell Park Estate; Jones Bros.

THORNTON HEATH.—Central school, Winterbourne site; Truett & Steel, Ltd.

TROWBRIDGE.—Cottage hospital (£15,000); R. H. Rodway, hon. secretary.

TUNBRIDGE WELLS.—Hospital and nurses' home; Cecil Burns, architect.

TYNEMOUTH.—Elementary school (£8,800); Education Committee.

WAKEFIELD.—Mill extensions, Ing Road; M. P. Stonehouse, Ltd.

WARRINGTON.—Business premises and warehouse, for the Co-operative Society; Co-operative Wholesale Society architect, 1, Balloon Street, Manchester.

WELLINGBOROUGH.—Extensions, Technical Institute; Northants Education Committee.

WELWYN GARDEN CITY.—School, for Herts E.C.; director of education, Hertford.

WORCESTER.—County Education offices, near the Shire Hall; director of education, County Education Department.